A history of a contested ideal: national parks for fauna conservation

Daniel Lunney

Office of Environment and Heritage NSW, PO Box 1967, Hurstville NSW 2220, School of Life and Environmental Sciences, the Faculty of Science, University of Sydney, NSW 2006 and School of Veterinary and Life Sciences, Murdoch University, Perth WA 6150.

ABSTRACT

This paper a) gives an historical view of national parks and other protected areas since the 19th century, b) gives a history of national parks and nature reserves in NSW, c) shows how recent has been the recognition that fauna conservation depends upon protected areas, d) reflects how much has been achieved in the last 50 years, and e) considers what must be done to stop an ever–increasing list of our fauna becoming extinct, including identifying the crucial role of scientific study in this endeavour. The evolving debate of what burden protected areas should carry in conserving the nation's fauna is a central theme of this paper. The First World Congress on National Parks in 1962 produced ideals that are inspiring, connected and ecological. What was not apparent in 1962 was the scale of the problem of conserving the flora and fauna of the world. I present the case that the principles of protecting areas, fauna conservation and scientific research for nature conservation have been slow to take hold and uneasy in their political relationships as a land use option, but are now beginning to be seen as a key element in conserving a nation's wildlife. Protected areas, whether for wildlife, game, plants, ecosystems or scenery for public enjoyment, are a late competitor for large tracts of land. The historical account shows how distinct African, American, British and Australian protected area development has been, with common threads being how the ideal of protected areas is contested territory, and the linking over time of the concepts of fauna conservation and protected areas. The British story differs markedly from that in the USA and Africa. In 1943, a Nature Reserves Committee was appointed to draw up a rationale and list of National Habitat Reserves and Scientific Areas. Its report led directly to the appointment of the Nature Conservancy in 1949 charged with the establishment of National Nature Reserves, disseminating advice on nature conservation generally, and carrying out the research relevant to those responsibilities. These are crucial dates for the origin of nature reserves in Britain, the important role of research, and the central position of an ecological outlook on nature conservation, rather than the more limited label of preservation. Protected areas in Australia are often under–estimated, both for wildlife research and as havens for fauna populations, and for the research value of protected areas to conserve biodiversity in NSW. The published articulation of these values, and specifically the value of National Parks and Nature Reserves for research, is hard to find except in the recent literature. A review of the last four decades of published papers shows how much has changed in this short time. Given the long history of resistance to establishing protected areas, Australia's fauna is at an ever–increasing risk of extinction as natural habitats are relentlessly lost to economic growth and a rising human population. The problem, as I read the historical record, is that although we are learning fast, the loss of species, landscapes and ecosystems is happening even faster. From the First World Parks Congress in 1962 to today, the interpretation of the value of the national parks for fauna conservation remains contested, but the weight of historical and scientific opinion is ever stronger on the need for protected areas for conserving fauna.

Key words: African national parks; biodiversity conservation; ecological history; game management; IUCN; nature reserves; Promise of Sydney; Nature Reserves in Britain; protected areas; recreation; research; reserve selection; Royal National Park; threatened species, American national parks.

DOI: https://doi.org/10.7882/AZ.2017.045

Introduction

National parks for fauna conservation

In its 1879 dedication of Royal National Park, just south of Sydney, New South Wales (NSW) was at the international forefront of the ideal of national parks and their role in conserving wildlife (Robin 2013; Lunney 2014). Despite this early reservation, I present the case that the principles of protecting areas for nature conservation and scientific research have been slow to take hold, and uneasy in their political relationships as a land use option, but are now generally seen as a key element in conserving a nation's wildlife. In contrast, the recreation value of national parks has long been appreciated. National parks represent a contested land use value, in stiff competition with commercial development interests, and even when protected areas are established, their importance for fauna research and conservation is further contested, and even excluded when other values, such as a wilderness designation, present a reason to limit access to researchers (e.g. Recher and Lunney 2003). This paper presents my interpretation of the history of this contested ideal. Specifically, I argue that protected areas are a magnificent place for scientific research, and it is only recently becoming recognised that protected areas need to assume the role of being the leading means of conserving the biodiversity of a nation. The aim of this paper is to understand the ideological contests in the advancement of the idea of national parks and similar protected areas, their role in fauna conservation, and their value for fauna research, with particular application to NSW, the author's home state, but including reference to the application of these ideas in Africa, Britain and the USA.

The enterprise of selecting and managing protected areas has a rich history but, in my opinion, is examined too rarely considering the bitter debates in society about whether they should exist at all, and what the multiple purposes and political aspirations are that they should serve (Robin 2013; Adam 2017). Thus part of the undertaking in this paper is to review the boldness and creativity in this endeavour, as well as the conflict. While the modern mathematical and intellectually exacting approach to the selection of protected areas, also called conservation planning, and assessments of their adequacy for fauna conservation has been a boon for conserving biodiversity, the value of a national park has long been contested, both on land and at sea (Lunney *et al.* 2017a). Although the modern collective term is protected areas, in NSW that basically means national parks and nature reserves, although there are other categories of land which have nature conservation as one or more of their objectives – for example, Flora Reserves within the State Forests in NSW (see Slade and Law 2017), and a range of Crown lands, managed either directly by a NSW government department, by trustees, or by local government. In addition to protected areas, a proportion of private land also contributes to conserving biodiversity. Lunney *et al.* (2017b) present details of our knowledge of the fauna in each land–use designation in NSW since 1879. Indeed, it is such analyses that set the stage for any discussions, and these crucial details provide the backdrop for my interpretation of the history of the idea of national parks in NSW.

The last half century has seen a transformation in thinking on this subject, and debates about the capacity of protected areas to conserve a nation's wildlife are surprisingly new. That debate is a central theme of this paper. There are supporters and critics of national parks, and given the changes in thinking over the last five or six decades, it is all too easy to be dated in an appraisal of what they should be for, and most importantly, what burden they should carry to conserve the nation's biodiversity, including the role of research towards realising this goal.

National parks and similar protected areas are increasingly being recognised as a brilliant idea for conserving biodiversity and protecting natural landscapes and seascapes. They also provide for "an innate affiliation of human beings with the natural world" (Wilson 1992, p 389). This concept of seeking a sense of connectedness with the rest of life has an ethical underpinning, and it is what E. O. Wilson has called *biophilia*. In his treatise on the *Diversity of Life*, Wilson (1992, p 350) wrote that to *biophilia* can be added the idea of wilderness, "all the land and communities of plants and animals still unsullied by human occupation." Such areas need to be protected from commercial exploitation, and herein lies the source of the conflict.

The central theme in this paper is that, given the recent avalanche of evidence of rapid environmental change, protected areas are becoming ever more important for conserving biodiversity. This realization is recent, well within my working lifetime, with Australian book titles such as *Wasteland to World Heritage* (Hall 1992) and *Spoils and Spoilers* (Bolton 1981, 1992) capturing the recent rise in the recognition that the "exploitation of the environment for short–term gains has always been followed by financial and human costs for later generations…" (Bolton 1992, p 178). Bolton concluded that sentence by adding "…but it has sometimes been possible to learn from error, and occasionally even avoid it." This paper was written with Bolton's closing thought in mind, particularly the error of failing to support research within protected areas, as well as in areas being damaged from exploitation.

In his chapter on "The British Impact", Bolton (1981, p 23, and again 1992, p 23) states that "One way of looking at the environmental history of Australia is to see it as a conflict between those who exploited the country to serve preconceived economic goals and imported attitudes of mind, and those on the other hand who sought to create a civilization where human use of resources was compatible with a sense of identity with the land." That identity as expressed in protected areas is a special case because it actively excludes exploitation for economic goals, especially short terms goals, in contrast with the time dimension of conserving natural areas and evolutionary processes (Lunney *et al.*1997).

Defining a protected area

The 2008 IUCN definition is that: "A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values[1]". The explanation that follows is that, "Protected areas – national parks, wilderness areas, community conserved areas, nature reserves and so on – are a mainstay of biodiversity conservation, while also contributing to people's livelihoods, particularly at the local level. Protected areas are at the core of efforts towards conserving nature and the services it provides us – food, clean water supply, medicines and protection from the impacts of natural disasters. Their role in helping mitigate and adapt to climate change is also increasingly recognized…" This paper examines these ideas in an historical context. It identifies some of the contest of the ideals, not only in setting aside areas from exploitative economic development as national parks or similar designations, but also the long–running tension of whether national parks should be for recreation, or should also include conserving biodiversity and encouraging scientific research.

---

[1] https://www.iucn.org/theme/protected–areas/about

While environmental histories often focus on the battle against exploitation, there is also a less obvious struggle, and that is to promote research, including research within protected areas. This tussle receives too little recognition, yet the value of protected areas for research is potentially immense. Lunney and Recher (1986, p 300–302) asked what is the value of a national park. They examined the definition of a national park as it was accepted in 1970 by the ministers responsible for national parks in all Australian states: "A National Park is a relatively large area set aside for its features of predominantly unspoiled landscape, flora and fauna, permanently dedicated for public enjoyment, education and inspiration, and protected from all interference other than essential management practices, so that its natural attributes are preserved." Lunney and Recher then proposed a more comprehensive definition: "A national park is a sufficiently large area set aside for the conservation of flora and fauna, dedicated for public enjoyment, education and scientific research and managed so that its natural attributes are retained or restored." What emerges from contrasting these definitions is that the idea of research, and the use of protected areas for research, is a contest within the framework of the planning and management of protected areas. This definition also promotes the idea of restoration, because few areas dedicated as national parks are pristine. Lunney *et al.* (2017b) compared the scientific licences issued to conduct scientific research within and beyond the boundaries of national parks and nature reserves in NSW and found that good use was being made of protected areas. The analyses also showed that while we have gained much recent information on fauna, there is a long way to go before we have a comprehensive picture across the state and of all faunal groups, both inside and beyond protected areas. Nonetheless, there is an encouraging use of national parks and nature reserves for scientific research. This trend needs to continue if we are ever to have a thorough grasp of the fauna of the protected areas in NSW, and the extent to which these areas have encompassed all the fauna of the state. In addition, there is a special need to provide the strongest support for long–term studies, studies that run for decades, and hopefully centuries, well beyond the tenure of any manager of a particular park or reserve or the structure of the organization that manages this extraordinary part of our natural heritage.

My approach to this historical method

To narrow the task of the review that I have undertaken here, I focus on fauna, or what has been, for decades, legally defined as fauna in NSW, namely birds, mammals frogs and reptiles. The advantage of centring the argument on this group is that these vertebrate species are commonly known as wildlife, and are readily recognized, even in heavily urbanized areas. Plants, fungi and invertebrates are all vital components of the concept of biodiversity, and arguably should be the focus of conservation (Adam 1998, 2013; Ponder and Lunney 1999), if not the dominant focus. There is no disagreement from this author, but as a vertebrate ecologist, I have a better grasp of the vertebrates. Importantly, for studying the history of fauna conservation, the vertebrates have the longest historical record, for example under NSW legislation (Lunney *et al.* 2017b).

There is a number of approaches to this task, and the one that I have adopted is a broadly chronological and narrative style. While the narrative device appears quirky, taking the form of a series of mini book and article reviews with extensive quotes from them, the global understanding lies in the sequence and juxtaposition of the ideas, their place and dates of publication and the growing sense of urgency in recognising both the loss of fauna, now more broadly biodiversity. There are many excellent and detailed studies that could be cited, but I hope that the papers cited represent the development of ideas about national parks, rather than just those I happen to have read.

While I have visited national parks and nature reserves in foreign lands – UK, USA, Greece and Indonesia – my sense of NSW is strongest. Also, what is apparent when you visit different nations is how much the concepts of protected areas differ, reflecting very different histories of the landscape, of nature conservation and of the role of government at different levels within each national boundary. Nevertheless, there are many common ideals, common elements of management, and there are international views and aspirations that make an international approach useful, particularly as it can point to strengths and shortfalls within any one jurisdiction.

This paper: a) gives an historical view of national parks and other protected areas since the 19th century, b) reviews aspects of the history of ideas about national parks and nature reserves in NSW, c) shows how recent has been the recognition that fauna conservation depends upon protected areas, d) reflects how much has been achieved in the last 50 years, and e) considers what must be done to stop an ever–increasing list of our fauna becoming extinct, including identifying the crucial role of scientific study in this undertaking. The evolving debate of what role protected areas should play in conserving the nation's fauna is a major theme of this paper, starting with the First World Congress on National Parks in 1962. There are many starting points, with Royal National Park in NSW in 1879 being a good candidate, but since this paper was presented at the forum run by the Royal Zoological Society of NSW as an official side program of the 6th International Congress on Protected Areas in Sydney in 2014[2], the first world congress in 1962 provided an identifiable, international starting point.

The first part of this ecological history examines the evolution of the idea of national parks and nature reserves. A global starting point is the First World Congress on National Parks, held in 1962 in the USA, because many of the ideas from disparate sources were articulated at the one time and, most importantly, published (Adams 1962). The next stage looks at the development of the ideas in Australia, with a particular emphasis on NSW. It is most relevant to note that terrestrial parks and reserves, and wildlife management (but not including fish), are State endeavours in NSW, so selecting one State is an appropriate means of tracking an idea as far reaching as establishing a national park system. Each State has its own story, and its own databases, and the NSW story is the one most accessible to me. Marine parks are different, and here the Commonwealth plays a major role (see Hutchings and Kenchington 2017, and Warner 2017 as examples).

In a parallel account, Lunney *et al.* (2017b) examined the NSW databases historically, and traced the growth of the area of national parks and nature reserves from 1879. We examined the increase in the information on the species of animals, in this case, birds, mammals, frogs and reptiles and, to a lesser extent, invertebrates, both on parks or reserves and off parks and reserves. Further, we distinguished among the different survey techniques for acquiring the knowledge of species, and the impact of the techniques on the relevance of newly–acquired data. This was a major exercise, the point of which was to demonstrate that any evaluation of the adequacy or otherwise of the pattern of parks and reserves across the landscape can now draw on some new information that will place any study in a more informed frame. Our concern too was that some contemporary approaches to assessing the adequacy of national parks and nature reserves to conserve biodiversity[3] conclude that they fall so far short that a totally new approach is called for, as proposed by Byron *et al.* (2014) for NSW. Such conclusions, we argue, do not take into account what is known, or when it became known, or what were the ideas and the resources available, with each passing decade, to see the issues and opportunities. Without an historical context, it may appear that parks and reserves have failed to conserve biodiversity. However, in their chronological context, the growth of ideas, area and knowledge has been remarkable (Lunney *et al.* 2017b). That development can be seen when an analysis of the 1962 World Congress on National Parks is taken as a starting point.

The concept of setting aside beautiful natural places, or recreation areas, was understood in 1970 in NSW (the year I joined the NSW National Parks and Wildlife Service as an education officer), but any systematic approach to wildlife conservation was a much more remote concept. By far the biggest fauna issue at the time was kangaroo management (that long–running and vexatious debate has been covered elsewhere, e.g. Lunney 2010). What is now instructive is to look at what was among the most advanced thinking in the world in 1962 on the subject of national parks, and to a lesser extent, wildlife. The intent here is to make the point that whatever modern concepts were accepted at the time of the 2014 World Congress of Protected Areas[4], their origin is recent, and to imagine that they are universally accepted is wishful thinking. The catalogue of losses of fauna, natural areas and continuing environmental damage bears testimony to the still nascent idealism expressed in the 1962 conference.

---

[2] http://enb.iisd.org/iucn/wpc/2014/html/crsvol89num16e.html for a summary of the International Union for Conservation of Nature (IUCN) World Parks Congress (WPC) 2014. (12–19 November 2014).

[3] In assessing adequacy of conservation of biodiversity it is important to have a clear concept of biodiversity. The definition from the 1992 United Nations Convention on Biological Diversity reads: "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. https://www.cbd.int/doc/legal/cbd–en.pdf, and https://www.cbd.int/convention/articles/default.shtml?a=cbd–02

The tenth meeting of the Conference of the Parties, held in 2010, in Nagoya, Aichi Prefecture, Japan, adopted a revised and updated Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011–2020 period. (https://www.cbd.int/sp/targets/) The 20 Aichi Biodiversity Targets are grouped under five strategic goals:

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use. (What these definitions and targets make clear is that fauna is but a small subset of the range of the subject of biodiversity. Consequently, by just focusing on fauna, I risk skewing the debate towards the obvious elements of biodiversity, and thereby crucially miss the total picture. In a strictly academic context, that is true, but there is a much broader group of society that cares about nature conservation that is not aware of international conventions, and terms such as Aichi Targets are unknown. I contend that fauna is a useful public shorthand for biodiversity, since it includes everything from migratory birds to cryptic marsupial carnivores, to desert rodents to bats dependent on tree hollows. On the other hand, I risk diminishing the magnitude of the issues involved, so I have provided the definition of biodiversity that I would use if the term were widely and readily understood).

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.(This goal has arguably the most cited of the Aichi targets in relation to protected areas: "Target 11 By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area–based conservation measures, and integrated into the wider landscapes and seascapes.")

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building.

The First World Conference on National Parks

The First World Conference on National Parks was held in Seattle, Washington, USA in 1962 (Adams 1962). There were five Australians listed as attending, with one from NSW, Howard Stanley of the Lands Department. In 1962, National Parks in NSW were managed by independent Trusts responsible to the Department of Lands. Fauna was managed separately by the Fauna Protection Panel, in the Chief Secretary's department, under the *Fauna Protection Act 1948* (NSW)[5]. The two organisations came together in1967 under the *National Parks and Wildlife Act 1967* (NSW), where the management of the NSW National Parks and Wildlife Service (NPWS) played a much greater role in the selection, dedication and management of national parks and nature reserves than had been done previously by the State government. As an education officer in 1970 in the newly–formed NPWS, my task was to understand the meaning and intent of national parks and nature reserves and how we could protect and manage the fauna of NSW, and then make these ideas, and their inherent ideals, public. In 1970, fauna meant only mammals and birds, as defined in the *Fauna Protection Act 1948*. The First World Conference on National Parks (Adams 1962) was one of the few major sources I had to draw upon. Some of the ideas it contained were already permeating a wider public, but the entire concept of a system of national parks that fulfilled the ideals in the first world conference publication was new. These ideals looked inimical to the concept of economic growth, and there were many powerful individuals and political forces hostile to the idea of large tracts of land being set aside from development and dedicated as national parks. Even after more than half a century, this remains a serious issue that needs to be continuously addressed if we are to conserve our fauna and our natural areas (Lunney 2017a).

The birth of an ideal

In an opening paper to the Seattle conference, Conrad L. Wirth (1962), as Director, National Park Service, United States Department of the Interior, recorded what he saw as a key moment in the history of the idea. He recorded (p 16) that: "The first action by the Congress of the United States to set apart some of the public lands for man's inner needs came during the Civil War. In 1864 the Congress granted the Yosemite Valley to the State of California upon the express condition: ".... that the premises shall be held for public use, resort, and recreation; shall be held inalienable for all times." In those words are to be found the seed of an idea and the beginning of a new national public–land policy – a policy that recognized the need for the holding of land in public ownership in perpetuity for other than material gain."

Wirth further records that, in 1865, to assist with the management of Yosemite Valley, Frederick Law Olmstead prepared a report defining the policy that should govern its management. The report is still, says Wirth, a classic treatise on public–park philosophy and laid the groundwork for the national park idea. Wirth writes that the philosophy is best expressed in the following extracts from the report: "Thus, unless means are taken by government to withhold them from the grasp of individuals, all places favorable in scenery to the recreation of the mind and body will be closed against the great body of the people. . . . To simply reserve them from monopoly by individuals, however, it will be obvious, is not all that is necessary. It is necessary that they should be laid open to the use of the body of the people. The establishment by government of great public grounds for the free enjoyment of the people under certain circumstances, is thus justified and enforced as a political duty."

Wirth adds that, a few years later, those thoughts found expression in the action of a group of men exploring the Yellowstone country in the north–western part of the United States. They decided that the natural wonders they had seen – including the great geysers for which the region is famous – should not be exploited for the benefit of a few individuals but held in public ownership for the benefit of the many. That idealism, Wirth records, brought into being the first national park and has been characteristic of the establishment of each succeeding one. In 1872 Yellowstone National Park was authorized by an Act of Congress.

Wirth charts the birth of the national park ideal, and while Yellowstone is the first area formally named as a national park, Yosemite Valley is arguably a candidate for the first such dedication. Wirth (1980, p 4) records that Yosemite was designated as a national park by Congress in 1890. Robin (2013) also commented on what may be seen as an American appropriation of the concept of a national park with Yellowstone being the world's first national park. The point is hardly in the name 'national park', but the embodiment of the ideal we now see in national parks, or the more expansive IUCN[6] term of Protected Areas.

---

[4] I am a member of the IUCN's World Commission on Protected Areas (WCPA). It "is the world's premier network of protected area expertise. It is administered by IUCN's Global Programme on Protected Areas and has over 2,500 members, spanning 140 countries." https://www.iucn.org/theme/protected–areas/wcpa

[5] A sensible legal or academic question was whether the Panel was responsible for fauna within National Parks. Undoubtedly it was for Nature Reserves, which were managed under the *Fauna Protection Act 1948*, and theoretically it may well have been for National Parks, but with a mere handful of staff, and the overwhelming issue of kangaroo management occupying half the time of wildlife management, there was no time for wildlife management in already protected areas.

[6] IUCN, International Union for Conservation of Nature. https://www.iucn.org/

Wirth (1962, pp 18–19) provides crucial insights into the meaning of national parks. He records that the Act of Congress that established the US National Park Service in 1916 defined a purpose that gave form and substance to a specific type of land use that in turn decreed the management philosophy for park lands and their resources. The particular passage in the Act that has guided the actions of the National Park Service for the past 46 years, says Wirth in 1962, reads as follows: "The Service thus established shall promote and regulate the use of Federal areas known as parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Wirth then adds that this passage is the most quoted and misquoted of all the laws applying to national parks. All too frequently only a portion is quoted, and its intent and meaning is thus distorted. Wirth[7] also commented that the philosophy expressed in the quoted passage represents almost a half century of evolution. In a fascinating detail, Wirth adds that the man credited with writing this important section of the Act, Frederick Law Olmstead Jr., a landscape architect, was the son of the man who wrote the report on Yosemite Valley in 1865[8].

Wirth's relevance to Australia

A number of features in Wirth's (1962, pp 13–21) paper are relevant to Australia, and NSW in particular. When Wirth presented his paper, in NSW there were only 14 national parks (which included 5 State Parks, a designation at the time for parks under 10,000 acres) and 15 nature reserves, giving a total of ca 0.75% of the area of NSW as parks or reserves. By the end of June 2012, that had increased more than 10 fold, to a total of ca 8.74% of the area of NSW (Lunney 2014)[9], and these numbers have expanded since (Lunney *et al.* 2017b). The idea of setting aside large areas of national parks throughout NSW had not taken off by 1962, despite the striking value of Royal, Ku–ring–gai and Kosciuszko National Parks. By contrast, the ideal of nature reserves, initially called Faunal Reserves under the *Fauna Protection Act 1948* (NSW), had assumed a growing importance. The management of both national parks and nature reserves, and fauna throughout the State, was amalgamated by the *National Parks and Wildlife Act 1967* (NSW). When the *National Parks and Wildlife Act 1974* (NSW), which is still in place, passed through the NSW parliament, the *Fauna Protection Act 1948* was repealed because the management of fauna was now covered by this new Act.

The definition of fauna matters. Under the *Fauna Protection Act 1948,* fauna comprised birds and mammals, in the *National Parks and Wildlife Act 1974,* fauna included reptiles for the first time. In a 1983 amendment to the *National Parks and Wildlife Act 1974,* 12 species of frogs were included. All species of frogs were included as fauna under the *Endangered Fauna (Interim Protection) Act 1991* (NSW). We might note that, in 1865, fauna was not mentioned in relation to Yosemite, but by 1916 wildlife is mentioned in the Act of Congress in relation to US national parks. In 1948 in NSW there is a major Act (*Fauna Protection Act 1948*) that focuses on fauna, and in a novel move, the Act sets up provisions for the dedication of land as Faunal Reserves for fauna, including its study[10]. In NSW, fish have been managed by a different department, and have not been considered as fauna. "Fish and wildlife" is a common term internationally, but the two have not been joined administratively in NSW. A history of fish protection and management, and the relevant legislation, is a separate story. Invertebrates gained their first legal recognition under the *Threatened Species Conservation Act 1995* (NSW), and a few species have been highlighted for attention.

The status of the ecological outlook in 1962

At the 1962 conference, the subject of ecology in natural areas was considered along with the conflict that it engenders. Fundamentally, says Beltran (1962, pp 36–38), national parks are established for two basic reasons: on the one hand, to preserve a particular area of exceptional beauty and attractiveness of whatever nature in order to make it a site for recreation and relaxation, and on the other hand to preserve a particular area in its natural state so that it will be useful in the study of scientific problems, "especially in the field of ecology, where zones that have not been disturbed by human intervention have extraordinary value." We have in this statement a clear recognition of the value of parks for science, and ecology in particular. Beltran added that, as a biologist, he sympathizes deeply with the second point of view. I agree; there is enormous value in areas in which human action has not disturbed nature and so lend themselves to studies of their native flora, fauna, and ecology.

---

[7] Wirth retired in 1964 and in 1980 published a book entitled *Parks, politics and the people* to provide, as he says, an account of his 36 years in planning and administering national parks. In his preface, Wirth also commented that public servants are subject to constant criticism, and they are often the victims of misrepresentation without benefit of any opportunity or means of rebuttal. Yet, Wirth adds, many of the best administrative, professional and scientific people in the country are government employees. Sadly, in Australia, there is a dearth of such books and memoires, and the silence of scientists in the public service across Australia in legitimate debate should be transcended and participation encouraged.

[8] Of more than a passing footnote, it is worth commenting that there are successive generations within Australian families who have actively worked to promote the national parks ideal. Examples can be found in the establishment of the NSW National Parks Association in 1957 and the generation that followed.

[9] The names and the dates of the national parks and nature reserves is listed in an appendix in Lunney (2014) to make life easier for later scholars because these data are hard to find. The only point to note is that in the appendix in Lunney 2014, Ku–ring–gai National Park was dedicated in 1892, not 1961, which reflects an error in one set of the NSW national parks and wildlife internal records in interpreting an Act of the NSW parliament in 1961.

[10] Nature Reserves were dedicated for more than fauna, as outlined in Lunney *et al.* (2012): "Allan Fox recalls that his friend and colleague Allen Strom, both before and during his period on the NSW Fauna Protection Panel (set up under the *NSW Fauna Protection Act 1948*), drafted hundreds of proposals for nature reserves. Their evaluation was based on four themes: the geology of an area; the land–shaping processes (geomorphology); the colonisation of the place by plants and animals (ecology); and the colonisation of the place by humans (anthropology)."

Beltran expands his thesis to note that "there is the lamentable fact that the human population is growing by leaps and bounds and that this uninterrupted increase in the number of people creates an increasing demand for space for them, and this demand may some day reach critical proportions[11]. Beltran comments that it is not difficult to obtain public support when land is for a use that can be considered economically justifiable, such as the production of food and lumber, or held as a recreational area open to everybody, but it is quite a different question when it comes to convincing this same public that it should voluntarily "deprive itself of the economic or recreational use of land only to have it serve as a tract for scientific studies – actual or potential – studies whose value the majority of the public does not know or is not capable of evaluating adequately". Thus we have the dilemma of the value of national parks. Scientific study, and ecology in particular, are recognized as important, but it is a hard sell to convince people to dedicate land, or areas of the sea, as a national park rather than use it for some economic advantage, and a far harder task to convince the same public to set an area aside to future scientific studies. This dilemma remains in Australia today, in the marine environment as well as on land.

Clawson and Fisher (1962, p 414), of Resources for the Future, Inc. Washington, DC, USA, opened their paper with the statement that, "The need to preserve the natural beauty and the wildlife resources of a nation are widely recognized; so is the need for outdoor recreation and for the enjoyment of nature generally by the public. One need not labor these points today among enlightened people, for they are generally understood. The problem arises in giving them specific implementation, into a system of parks for a nation." However, Clawson and Fisher then did not go on to elaborate on how parks might preserve a nation's wildlife. Nor did they say how strong was the contingent of "enlightened people". Were they just referring to the people at the conference? Wildlife is mentioned, but when you read the whole conference, it is not a dominant theme, so it hard to see what Clawson and Fisher had in mind for the future. Their paper (pp 415–416) then takes a broad planning approach, for example, the authors consider the major kinds of areas that may eventually be included in a nation's parks: wilderness areas or natural preserves, where the emphasis is upon keeping the area as nearly untouched; unusual scenic, scientific, or historical areas, of national significance, but available for general public use; extensive outdoor recreation areas, where the emphasis is upon relatively natural conditions; more intensively used outdoor recreation areas; local recreation and activity areas, intensively used and intensively developed. Given that list – clear thinking for the time – it is hard to see how such a system of national parks could preserve the "wildlife resources of a nation". One could conjecture that conceptually the need to preserve a nation's wildlife is recognized, but the means of doing so in 1962 was beyond the ability of the international community of national park professionals.

The state of knowledge and objectives in 1962 as revealed in conference appendices

Appendix C of the conference publication, under the heading "Parks around the world" (Adams 1962, pp 408–410, but no author to this appendix), presented a very short summary of national parks. The paragraph that mentions Australia was brief, uninspiring and incorrect: "In Australia, the National Park near Adelaide in South Australia dates from 1891. New Zealand's first park, Tongariro National Park, was established in 1894."

In contrast, the summary in Appendix C stated that, "Almost all the measures taken to establish national parks and nature reserves had two objectives: preserving the beauty of the natural landscape and preventing the extinction of plant or animal species. A third objective could – and in fact should – also be assigned to these protected territories: the conservation and the scientific, systematic study of undisturbed natural conditions." What emerges from this statement is that the prevention of the extinction of animals and plants is a goal, and scientific research is to be encouraged. What is not clear is how the prevention of extinction can be achieved. That remained as the challenge.

Appendix B of the conference publication, under the heading "History of the IUCN" (Adams 1962, pp 406–407, but no author to this appendix), outlined the history of this major organization. What is important here is that there is an international conception of nature conservation that is not much longer than living memory and that its principles are modern in outlook. The Appendix states that, since the beginning of the 20th century, many governments, as well as private organizations, have been concerned with the international aspects of the protection of nature. The major leap in activity occurs after World War II, when the Swiss League for the Protection of Nature, the French government and UNESCO organized a conference held at Fontainebleau in 1948. There, the International Union for the Protection of Nature was officially established. Its name was later changed to the International Union for the Conservation of Nature and Natural Resources. Its main field of activity lies, says the Appendix, in conserving the flora, fauna, soil, water, and other natural wealth that constitute the earth's basic assets, and it deals with threats to the world's wild lands and living resources. The Appendix makes a statement of intent: "Because conservation should be based on the principles of ecology, the Union has used an ecological approach to conservation problems. This is the task of its Survival Service Commission, which concerns itself with species of plants and animals threatened with extinction, and of its Commission on Ecology, its International Commission on National Parks, and its Information Center." The Appendix concludes by stating that although primarily a nongovernmental organization, the Union numbers among its members 20 governments and more than 300 national organizations from 60 countries. It depends for financial support on individuals, private organizations, governments, and governmental agencies[12].

---

[11] Within six years, Ehrlich (1968) had published *The population bomb* which overtakes Beltran's phrase "may some day reach critical proportions".

Looking back at the 1962 conference and NSW in 1970

Thematically, what emerges from a close reading of the 1962 conference are ideals that are inspiring, connected and ecological. They have international appeal and reach across generations. What is not apparent in 1962 was the scale of the problem of conserving the flora and fauna of the world, of a nation, or for NSW, the entire State. NSW may seem like an odd unit if you are thinking internationally, but under the Australian constitution, most matters to do with the land and all it contains, including the water, the forests, the national parks and the wildlife, are State matters. Also, while one State may appear to be a small unit within Australia, NSW is in fact four times larger than Britain. In 1970, when I started in the NSW National Parks and Wildlife Service, the number of people working on fauna was tiny. There was one officer responsible for mammals (Peter Foster), another for birds (Alan Morris), a veterinarian (George Wilson), a chief wildlife officer (Allan Fox), an assistant director for wildlife (Bill Steel) and a director who was a zoologist by training (Don McMichael). There were also some law enforcement officers dealing with wildlife. Rangers within parks or reserves had some local responsibilities, but they were primarily confined to managing the parks or reserves for which they were responsible. Thus, while the ideal is grand, the capacity to even see the scale of the problems, let alone see solutions, was very limited. There were committees to help make up the shortfall, particularly the Advisory Council to the Director of the National Parks and Wildlife Service, and while providing valuable and scholarly input, they had their limitations, as outlined by Recher (2017).

The NSW NPWS had, from its inception in 1967, identified education as one of the means of engaging a much wider community in the ideals of national parks and in wildlife management. By 1970, there were three newly–appointed education officers (Roland Breckwoldt, Liz Dunfield and Dan Lunney). We had little material to draw on as education officers, but one of the texts was Freeman Tilden's (1968) book with the simple title of 'The national parks'. It was about the USA, but we shared much in common. The opening sentence (p 7) is clear, and it still resonates: 'The value of the national parks to the scientist, the student, and the researcher is with some, perhaps not with many, a touchy subject'. Tilden then put the subject into a conversational level to reveal both his sense of humour, and the need for it to deal with hostile views. He says that he sometimes meets an enthusiast who delights in the parks as 'pleasuring grounds', but who squints horribly when he happens to mention the scientific importance of the wilderness areas. Tilden then recounts the challenge to him in quotes: 'I see', he says, 'you are one of those fellows who wants to keep everybody out of the parks so that the long–haired, nearsighted professors can prowl around in them, working up material for a master's degree.' Of course, Tilden clarifies the point, the park management that provides for lazy enjoyment for visitors is also ideal for the natural scientist and student. That may not have changed as much since 1968 as one would like, but what has changed was the need that Tilden saw in 1968 (p 8) to introduce a word not yet in common usage. That word was 'ecology'. We can now see it in daily newspapers, but what it meant was new. Recher *et al.* (1979, 1986) saw that problem for Australia and produced a textbook to help rectify that shortcoming.

As education officers in the newly–formed NSW NPWS, what was notable from our daily encounters with students, community groups and fellow public servants was the rising articulation of such difficult questions as: what is the impact of fire on the fauna; what will be the impact of woodchipping on the fauna in the Eden region (the first shipment of woodchips left the port at Eden in 1970); what species have become extinct, and how many more will go extinct and what can be done about it; is legal protection of the fauna enough; are national parks and nature reserves conserving our fauna, and how are kangaroos managed? To me, these difficult questions could not be answered. There were neither the resources allocated to address them, nor was the ecological research being undertaken to provide the answers. Consequently, moving from education to research was an obvious next step, when the opportunity arose three years later to work with ecologist Harry Recher at the Australian Museum to study the effect of the 1972 fire on the small mammals in Nadgee Nature Reserve (e.g. Recher *et al.* 2009; Lunney *et al.* 2008, 2012). However, I have never forgotten that communicating the science of what was being done remained vital for the ever–widening community of interested groups and, therefore, the continuation and expansion of national parks.

Modern perspectives on the global ideal

The USA

In his absorbing book, *Preserving nature in national parks: a history*, Sellars (2009, pp xiii–xiv) makes the startling observation that when he first came to work as an historian for the US Park Service in the early 1970s, he assumed that biologists must wield considerable power and influence because of the need to manage the ecologically important natural areas. In an amusing aside, he assumed that this was the case because of two very competent, outspoken biologists in the Santa Fe office where he worked. However, he said that this notion faded as he acquired an understanding of the Park Service's power structure. It was only in the 1990s, Sellars writes, while researching his history of the management of nature in national parks, that he became fully aware of the real plight of the biologists. Sellars records that the National Park Service had long held steadfast to other priorities. Here he is most biting: "The gospel of the great out–of–doors had truly become a forceful, messianic impulse propelling the Service towards promoting public access, use, and enjoyment of these great scenic natural areas. To many Park Service leaders, who thought nature could take care of itself, biological expertise and advice seemed almost unnecessary and burdensome." Sellars (2009, p 204) provides more detail in his chapter on "Science and the struggle for bureaucratic power: the Leopold era, 1963–1981". One group, by far the stronger, and exemplified by Conrad Wirth's career, emphasised recreational tourism and public enjoyment, and the other group represented mainly by wildlife biologists, focused on preserving the ecological integrity in the parks.

---

[12] I was a member of the IUCN Species Survival Commission (both the marsupial and bat specialist groups) and I am currently a member of the IUCN World Commission on Protected Areas (Oceania division).

In an unambiguously–named book, *Protecting the wild: parks and wilderness the foundation for conservation*, the editors (Wuerthner *et al.* 2015) have assembled the case of why protected areas are still vital, but must be enlarged and connected to sustain the full diversity of life. Butler (2015, p xxiii) points out that, as the arguments for conserving protected areas morphed from aesthetic and recreation to scientific and ecological values, previous rationales were not abandoned, but built upon. He added that the advocacy for parks and wilderness areas deepened with insights from the fields of landscape ecology and conservation biology in the latter part of the 20th century. Butler reflects that there are now far fewer places on Earth which could be described as intact or wild and where wildlife is secure from the pressures of humanity. His North American orientation shows in his next sentence (p xxiii) where he exclaims that is why there are no flocks of passenger pigeons to darken the skies or vast herds of bison on the Great Plains. He adds that is why modern conservationists have viewed protected areas and wildlife protection laws as the key tools for combating the human–caused extinctions. These thoughts also apply to Australia.

The strongest words to support the 'protecting the wild' thesis are those of John Terborgh (2015, p xi). He opens his statement that biophilia – an inherent love of nature and its creatures – is manifest in the fact that nearly all the 200 or so nation states have formally designated areas for nature protection, the most iconic being national parks. He points out that nations around the world have established more than 130,000 protected areas for nature, encompassing 13 per cent of the terrestrial realm, but only 2 per cent of the marine realm. That is the positive side, says Terborgh, but recently a group of what he calls 'contrarian environmentalists' have promulgated radically different views. A leading claim, Terborgh identifies, is that conservation is failing, based on the undeniable fact that species are still going extinct. Terborgh is then at his critical best and points out that instead of seeing this unfortunate fact as testimony to relentless human pressure and the need to enlarge the scope of nature protection, the contrarians infer that the continuing extinctions demonstrate that parks and other protected areas are not the answer. Here the timing matters, and Terborgh (2015, p xii) points out that even after there was a widespread awareness that the global extinction crisis was underway, we did not know how to contain it. Terborgh says that the science of biodiversity conservation[13] did not mature until around the year 2000 so that only a single generation of conservationists has been aware of the science of landscape–scale networks of protected areas specifically designed to sustain large carnivores and other keystone species and processes. Terborgh then throws out a rhetorical question: how can one claim with a straight face that conservation is failing and that protected areas are not the answer? Terborgh is then emphatic, the fact that 13 per cent of the Earth's land surface has been designated for nature conservation speaks to a widespread recognition that protected areas are the answer. Terborgh (2015, p xiii) does not ease up in his critical commentary, saying that some contrarians propose that the goal should not be preventing extinctions or preserving biodiversity, but instead be maintaining 'ecosystem services'. Of course, Terborgh acknowledges their vital importance, but pleads with the reader not to confuse ecosystem services with biodiversity conservation. The example he gives is that a plantation of non–native trees can produce some ecosystem services almost as well as a native forest, but the biodiversity value of the former is near zero.

Terborgh (2015, p xiv) identifies habitat loss, habitat fragmentation, overexploitation and alien invasive species as the important drivers of the contemporary human–driven extinction crisis. To answer how all these drivers can be avoided, Terborgh states, is to protect and reconnect habitat, exclude poachers, and combat non–native species. That, says Terborgh, is exactly what national parks and other protected areas are intended to do. Terborgh is again emphatic by saying that there is no alternative, parks and other protected areas are the answer.

In his book, 'To conserve unimpaired: the evolution of the national park idea', Keiter (2013, p xii) opens with a very American view that his book 'addresses the American national park ideal, which has long captured the world's imagination'. However, Keiter's next sentence rings true for Australia, namely that his book explores the anomalous fact that national parks and controversy go hand in hand. What is odd in this thought is the word 'anomalous'. It seems almost universal that national parks, or more broadly protected areas, are an anathema to those who see these lands, and the resources they embrace, as a barrier to commercial gain. Adam (2017) recounts one such Australian struggle, that of the dedication of rainforests in NSW from logged areas to national parks, and then their listing as world heritage sites. Although Keiter (2013, p xiii) says that the national park ideal is regularly proclaimed as 'America's best idea', he then says that it is not actually a single idea, but an amalgam of ideas, including wilderness areas, a tourist destination, a recreational playground, a commercial commodity, an ancestral homeland, a natural laboratory, a wildlife reserve and a vital ecological cornerstone. Keiter then makes the observation that national parks have never been secure and isolated nature reserves. He also observes that, as science has come to play a more prominent role in park management and our understanding of ecosystem processes, we are expanding our definition of nature conservation to embrace the broader landscape and thus our view of the national park idea itself. What Keiter (2013, p xiv) has captured is the growth of the scope of nature conservation which, as he points out, has expanded to include endangered species, social justice, science, economics, and more recently, climate change, biodiversity conservation, large predators, wildlife policy, wilderness preservation and the management of ecosystems. He adds that from the outset, national parks have occupied a central position in nearly any conservation policy debate. This last point is central to grasp when evaluating the role of national parks, and related protected areas, in the broad conservation debates and, in our focus here, on fauna conservation.

---

[13] Terborgh (2015, p xiii) says that as a professor, he defines conservation science to his classes as the quest to understand how to prevent extinctions. He also comments that when he began his career 50 years ago, the science of extinction was in a rudimentary state.

In their review of wildlife polices in the US national parks, Wagner *et al.* (1995) present a spirited and comparatively modern appraisal of the appreciation of wildlife and research in national parks. They identify that more than 120 species of threatened or endangered plants and animals are known or suspected to occur in the national park system, and parks play an important role in preserving species from extinction (p14). They outline the beginnings of science and nature preservation in the national parks system, and refer to a series of publications, the first being *Fauna of the National Parks of the United States* by Wright *et al.* (1933), and present selected passages from it (pp 22–25). One policy, striking in its simplicity, states that "a complete fauna investigation… shall be made in each park at the earliest possible date" (p 25). If applied to NSW, even just for vertebrates, we have yet to meet that challenge (Lunney *et al.* 2017b). The opening paragraph under the heading 'Science administration for and in the system' states that reviews of science in the national parks system have all emphasised that effective management of natural resources requires a scientific understanding of those resources… and that "understanding can only come about from a carefully planned, well–executed research program that is free to seek and report the objective reality of park ecosystems and the effects of ongoing or contemplated management programs on those systems." (Wagner *et al.* 1995, p 94). They also point to what becomes clear to any research scientist within a large bureaucracy, namely that "scientific evidence is only one of several influences that shape policy… and that policy may at times be contrary to research recommendations for political, economic, organisational or other reasons." (p 99). For those in the profession of being researchers in national parks, some of the US problems mentioned will strike a chord, such as, "in some case, rangers impose constraints on research activities…" (p 100), or "Data suppression apparently continues in the Yellowstone bear situation. In 1993, former Yellowstone bear biologist David Mattson reported that when his studies on grizzly bear population trends contradicted the official position, his superior seized his files…and ordered the office secretary to open his mail…[and thus] present a powerful and damning portrayal of the entire history of bear research and management in Yellowstone." (p 103). This chapter in Wagner *et al.* concludes by stating that some very good science has been conducted in the national parks system but, they add, "We have found a disturbing number of inadequate facility with the relevant literature, superficial grasp of ecological theory, and intellectual insularity" (p156). Wagner *et al.* (1995, p 156) draw the obvious conclusion that when superficial and ambiguous use of ecological concepts is coupled with organisational and policy constraints on objectivity there is real cause for concern. What is also alarming is their statement (p 157) that park biologists have been spread thinly over an array of projects for which they may not have had the specialised training… and have had insufficient contact with the scientific mainstream. They conclude this point by noting what must be a universal lament, namely that, "Research budgets have been meagre and whimsical." (p 157). Wagner *et al.* (1995, p 158) open their final statement with the view that, "The National Park System is a treasure of inestimable worth to the American people. Valuable as it is today for recreation, education, and science, it will have even greater value in the future." That view certainly has resonance worldwide, it is one of the beliefs that help scientists survive the hurdles of conflicting policy constraints, lack of understanding of the role of science and the time it takes to conduct research, and meagre and whimsical budgets.

A US–African comparison

As their title makes clear, the text by Wagner *et al.* (1995) is focussed on the USA, but on the first page of their text they present an apparently odd comment. They state that Caughley and Sinclair (1994, p 268) contrasted the 'philosophical springs' from which the African and American national parks flowed – the former to preserve great wildlife resources and the latter to protect spectacular scenery. Wagner *et al.* (1995, p 1) then hasten to add that the Caughley and Sinclair dichotomy no longer holds for today's system. They note that many American areas were established primarily to conserve unique and spectacular biotas: coral reefs, wading bird populations, desert vegetation and forests. In fact, Wagner *et al.* (1995, p 2) add, elements of this concern go back to the *National Parks Organic Act* which, in 1916, stipulated that: "The fundamental purpose of said parks is to conserve… and the wildlife therein…". Wagner *et al.* (p 2) then list the first monograph in the national park series – *Fauna of the national parks of the United States* (Wright *et al.* 1933). What stands out to this reader is that this appears to be defensive writing.

Both Graeme Caughley and Tony Sinclair are well known in Australian ecological circles, including for their wildlife research in Africa, so reading their text was an obvious next step. What they did say differed somewhat from Wagner *et al.* (p 1). In the Caughley–Sinclair (1994, pp 268–269) view, "The national park idea has two quite separate philosophical springs whose streams did not converge until about 1950. The first is American, exemplified by the US Act of 1872 proclaiming Yellowstone as the world's first national park. The intent was to preserve scenery rather than animals or plants. Hunting and fishing were at first entirely acceptable. The second spring is the 'British colonial', with the Crown asserting ownership over game animals and setting aside large tracts of land for their preservation. The great national parks of Africa grew out of these game reserves, some physically, others philosophically. Wildlife was the primary concern and scenery came second if at all. The first was Kruger National Park established in 1926 on a game reserve proclaimed in 1898. Kenya's first was established in 1946 on the Nairobi common."

A number of features emerge from this differing emphasis. For me, the most important is that the African and US national parks had separate origins. What is distinct is the African emphasis on game and the importance of wildlife. While Caughley and Sinclair put a date of 1950 when the ideas about national parks began to converge internationally, it seems more realistic to appreciate that wildlife was considered within the US national parks before that date, even if at a low level of investment of resources. What the date 1950 makes clear is that protected areas for wildlife is a relatively recent idea, one that has arrived very late on the scene for deciding how the land of a nation could, or even should, be allocated. Protected areas, whether for wildlife, game, plants, ecosystems or scenery for public enjoyment, are late competitors for large tracts of land. Hence the current struggle to capture comprehensive, adequate and representative areas for parks and reserves. What also may be read into this discussion is absence of the idea that national parks should serve a primary role in conserving a nation's wildlife. One could interpret this 1994–1995 debate as preceding the view that protected areas should serve this role. The focus at the time was the management of wildlife within the national parks, not protected areas as the keeper of the wildlife of an entire nation. That idea is very modern and adds to the complexity of conservation planning for protected areas, and for debate both in a wider public and within the political arena. Current emphasis on endangered species and the spectre of extinction is one way of positioning protected areas as the most viable conservation option. In turn, this inextricably links the conservation of biodiversity, including wildlife, plants, invertebrates and fungi, to the concept of protected areas.

Africa

The African story of game reserves and national parks is intriguing, and deserves its own comprehensive history. I cover only a few points here to address the theme of protected areas being a contested ideal, or as Caughley and Sinclair (1994, p 269) politely express it, all national parks established for 40 years or more have had their objectives and their management modified several times. Carruthers (2008) presents a history of conservation and wildlife management in South African national parks 1930s–1960s, one she terms "a preliminary attempt to chart a shift in conservation biology and wildlife management from a custodial "balance of nature" to a manipulative "command–and–control" or "management by intervention" in South Africa during the critical political period of the 1950s and 1960s". Carruthers opens her account by stating that wildlife in southern Africa had been seriously depleted by the end of the 19th century, principally by commercial and subsistence hunters but also by sportsmen, and that in order to protect what little remained, a number of game reserves were proclaimed at this time and staffed with "game wardens" in overall charge. Their duties were based on the aim of rebuilding stocks of antelope, buffalo and other species that were the quarry for hides, horns, biltong (dried meat) and sport, and management strategies included guarding these desirable species of wild animals against poaching, preventing public access into game reserves, at times removing people from the reserves and exterminating predators, such as lions and other "vermin". Carruthers notes that as far as the formal biological sector was concerned, South Africa's university and museum scientists were not a strong pressure group and had no influence on government. What is fascinating, especially for Australians, is that Carruthers says that it was the veterinarians and agriculturalists in government service that were the country's most powerful field scientists in the first half of the 20th century. The explanation for this, says Carruthers, was their high political and economic profile because of the contributions they could make in protecting and promoting the developing commercial livestock and crop–farming industries that were so economically important after 1910. More important was the belief that wild animals spread diseases to domestic stock and that rather than establishing "worthless" game reserves and national parks, all land should be in some kind of "productive" use. Carruthers states that the majority in the Division of Veterinary Services of the Department of Agriculture were vehemently opposed to establishing protected areas and to any form of wildlife conservation. Carruthers summarises the state of play for the 1920s and 1930s by saying that there were two opposing views on wildlife management in South Africa: a divide between the national park structure and the agricultural scientists, particularly the veterinarians. We thus have a vivid picture of a contested ideal, in this case, from a sector that had no counterpart in Australia, or it seems, the USA.

There was, says Carruthers, some appreciation around the time of the First World War that studying wildlife in its natural habitat might have scientific reward and that a protected area such as a game reserve or national park might be an appropriate "training ground for the scientific student, whether in botany, zoology, or other directions ...". She adds that such ideas were not enthusiastically pursued at the time. The primary national goal was the promotion of commercial agriculture through scientific advance and disease control, not the study of indigenous biota. Therefore, Carruthers states, if wildlife prevented or retarded agricultural development and productive land use, it had to be eradicated, as had been done both in Zululand and in Addo. But, on the other hand, Carruthers adds, the extinction of the blue antelope *Hippotragus laucopha* and the quagga *Equus quagga* in the 19th century had generated awareness for saving rare species. Although there was no policy in connection with breeding or managing such endangered animals, three small species–specific national parks were established in the Cape Province to save them. Carruthers also notes that no particular veterinary or zoological expertise was applied to their welfare and in many respects the species fared badly.

A general election in 1948 brought a new government to power which, Carruthers records, had promised its voters that white landowners and commercial agriculture would never be compromised through nature conservation. Carruthers comments that wildlife management thus spoke directly to the new generation of Afrikaner conservationists that emerged after 1948, empowered by the National Party and its policies. Wildlife management was a science that linked wildlife and place in the pursuit of nationalism: it was scientific passion of a specific kind, embedded in the idea of Afrikaners as outdoorsmen, but nonetheless men of science, and of whites as custodians of a well managed natural landscape free of black Africans. Among the points that stand out for Australians is that the concepts of wildlife management and national parks are embedded in a government culture, and while South Africa presents sharp policy contrasts to Australia, the idea that conservation of natural areas and the native wildlife is the subject of the changing philosophies from changes of government is very familiar.

At a national conference on nature conservation held in the Kruger National Park in 1955, Carruthers reports that a Steering Committee for Scientific Research was appointed, mandated to give advice and guidance on scientific projects, and to lay the foundation for effective conservation and wildlife management. It was also agreed that game rangers should protect wildlife from destruction; control destructive and dangerous animals; investigate animal–human conflict; study animal populations; disseminate information to the public, and observe characteristics and life cycles of the fauna and flora. Carruthers notes that by 1957 it was being declared in proud terms that the Kruger National Park's motto in respect of nature was "management by intervention" thereby obliterating the aspect of "wonder" or "romance" that had been so attractive. In a critical vein, Carruthers adds, later scientists have observed that management of the Kruger and other national parks (although the Kruger received the bulk of the attention) was conducted on an agricultural model, like a commercial farm with stock management, biological productivity or "carrying capacity" as a guiding principle. Carruthers captures the approach by noting that being focussed on animals and plants, rather than ecological services, processes, function and sustainability as is becoming the management philosophy today, was one of the cardinal tenets of "management by intervention" or "command–and–control." In order that the number of animals remained in "equilibrium" with the food supply, a great deal of scientific work was done on population dynamics and herd structures. Complex modelling determined optimum numbers of different species, and sophisticated aerial census methods, by fixed–wing aircraft and helicopter, were developed. This led to scientific advances in animal translocation, as some large mammals were moved from one protected area to another. Carruthers importantly notes a matter of great interest to Australians, namely that this form of management also led to the most controversial of the interventionist regimes, the culling of "excess" animals, a direct intervention in ecological processes in order to maintain what was then thought to be "equilibrium" or "stability." Culling became a refined art with the aid of aerial censuses, drugs and darting techniques and ideas around the optimum manner in which different species should be regulated. Carruthers concludes with the comment that "management by intervention" came to be regarded with pride by South Africa's wildlife scientists and managers.

Not surprisingly, as Carruthers notes, it is now appreciated that there were scientific flaws in this thinking and latter–day managers came to appreciate that resilience and long–term survival, not maximum current production, was the preferable paradigm within which to manage an African national park and that fresh ideas have more recently come to permeate national park management in South Africa, characterised by a series of alternate system states that change over time, in which scale is explicit and spatial variation is critical. Carruthers uses a term that now permeates Australian thinking, namely “adaptive management” or “learning by doing”, noting that the methods of “command–and–control” that dominated from the 1960s to the 1990s have broadened from concerns around individual species to a focus on ecosystems and biodiversity and include the human communities around national parks. All this sounds familiar in Australia today, but what is also evident from Carruthers’ history is the distinct origins of South Africa’s path to this current position.

There is, Carruthers concludes, a considerable literature on how national parks’ management illuminates a changing national culture, but less on the theme of changing scientific theory and disputes among scientists, changes in management direction, and friction between ambitious people and agencies, all of which interact with political pressure. South Africa, Carruthers adds, is changing once more to include the previously disadvantaged who wish to utilize national parks as employment opportunities and drivers of regional economic welfare. In short, national parks are in all respects, Carruthers remarks, deeply humanised landscapes. In effect, as I read her fascinating historical account, we can see how distinct South Africa is from the USA and from Australia. One of the common threads that I see is how the ideal of protected areas is contested territory and how the concepts of fauna conservation and protected areas are linked.

The subject area of African national parks, their origins and development, is a fascinating study in itself, but here I am endeavouring to examine how the ideas have changed, and how quickly they have changed. Africa presents a great case study because the animals are so spectacular, the magnificent landscapes so well captured photographically, and the politics are so dramatic. It is hard to imagine that, from the time that Royal National Park was dedicated in 1879 in NSW, changes in the ideas of wildlife management and national park ideals would not have been other than tumultuous over the same period. Carruthers has made that clear, and other writers present different emphases which allow an even more defined picture to emerge. Jones (2006), for example, opens her history with a political ecology accent by simply stating that many of the protected areas in Africa owe their origin to the practice of hunting. Hunting has, Jones explains, played an essential role in livelihood provision (game meat, hides etc.) and social functions (rites of passage, social cohesion), and hunting for sport existed among colonial elites, starting in the nineteenth century. It is the colonial hunters, Jones states, that tried increasingly to establish a monopoly over game resources in Africa, leading to tensions with subsistence hunters. Hunting parks were thus established in the latter part of the 1800s but, adds Jones, these were a far cry from meaningful protection of wildlife. Jones makes a point that may not be visible from Australia when she states that it was the US National Parks model to which Africa owes much of its approach to the management of protected areas, notably as many hunting reserves and game parks were reclassified as national parks in the 1940s. Jones then adds a new twist by noting that this model prioritises ‘recreation’ and ‘preservation’ with the implication of recreation, particularly in South Africa, being that protected areas became a source of white nationalism – wildlife tourism was of no interest to indigenous populations. Jones concluded her review by noting that wildlife, biodiversity and valued environments are clearly not static resources, and their distribution and prevalence are fluid and intimately linked with policy and politics. She adds what can be seen as almost a universal comment in this field, namely that competing agendas and ways of seeing the environment among different interest groups add to the complexity of the story of conservation and challenges to environmental governance.

Britain

In his engaging book on ‘England’s national nature reserves’, Marren (1994) gives an enlightened account of their origins. Nature reserves, he noted, are barely a century old, but the word ‘sanctuary’ is as old as history itself. The first wildlife sanctuaries in Britain for which there is historical evidence, says Marren (p 1), are the Norman Royal Forests. In the latter middle ages the role of forests as sanctuaries for beasts of the chase began to take second place to their income earning possibilities. Of more enduring benefit for nature, Marren (p 2) states, were the private parks of medieval England, and England still contains private parks of venerable trees. In that sense, says Marren, nature reserves already existed before the term came into fashion. Marren (p 3) makes the useful, even if amusing, observation, that before industrial times, there was arguably no great need for nature reserves, but that it might have been useful to preserve areas of virgin woodland or pristine bog, but for that, says Marren, we would have to have made a start in the Bronze age. The origins of the modern concept can be found, says Marren (p 13) in the Scott report, published in 1942, and largely drafted by Dudley Stamp. It recommended the ‘long overdue’ establishment of national parks and it recognised that nature reserves were something separate, and in terms of access, they were the very opposite. In a crowded country, public amenity and nature conservation could not go hand in hand. After WWII, the post–war reconstruction minister asked for expert advice on ‘reserves, sanctuaries and sites’. Marren (p 15) records that the last and most famous of the confusing archipelago of committees was the Wildlife Conservation Special Committee, whose membership reads like a who’s who of the great names in ecology and nature conservation. It was chaired by Sir Julian Huxley, although Tansley bore the main burden of correspondence, and particularly influential were Cyril Driver, Max Nicholson and Richard Fitter. The Committee’s final report, published as a White Paper in 1947, had the title of ‘Conservation of Nature in England and Wales’, generally known by its Whitehall–ese name of Cmd 7122. It recommended six types of reserved areas: national nature reserves; conservation areas, national parks; geological monuments; local nature reserves and local education reserves. It was also the last nail in the coffin, says Marren (p16), for national parks to play a major role in nature conservation. The 1947 report also recommended setting aside 73 reserves in England and Wales covering some 28,350 ha, which represented 0.002% of the land surface. The Nature Conservancy was set up in 1949 (Marren p 21) and two years later acquired its first nature reserve. Suitably qualified staff were hard to find, and Marren (p 23) states that Max Nicholson's (1957) book, *Britain's nature reserves*, provides an interesting insight into the philosophy of the acquisition of National Nature Reserves. The aim was to build up a carefully balanced selection of the best examples of the different types of habitat found in the British Isles, and the aim in doing so was at least as much to provide open–air laboratories for scientific study as it was to protect Britain's wildlife.

In a guest editorial entitled, "The ecologist and environmental history – a British perspective" Sheail (1995) provides further insight into the implementation of nature conservation in Britain. Sheail recounts that a proposal by the Forestry Commission in 1938 to establish 'ecological reserves' on its properties held out the possibility of experiments on a scale rarely available to ecologists, but noted that it was recognized that to achieve a permanent level of control, the ecologist would have to own the experimental site. Following a Conference on Nature Preservation in Postwar Reconstruction, and then a Nature Reserves Investigation Committee, appointed in response to a Government request in 1942, the Council of the British Ecological Society realized that if ecologists could establish themselves as the primary group responsible for devising and implementing a national program of nature conservation, they would have gone a long way towards transforming themselves into a new and powerful force. A Nature Reserves Committee, under Tansley, was appointed in 1943 to draw up a rationale and list of National Habitat Reserves and Scientific Areas. As chairman of that Committee, Sheail noted, Tansley asserted considerable influence over its report that led directly to the appointment of the Nature Conservancy as a further research council in 1949, charged with the establishment of National Nature Reserves, disseminating advice on nature conservation generally, and carrying out the research relevant to those responsibilities. What Sheail has provided is a set of dates for the origin of nature reserves in Britain, the important role of research, and the central position of an ecological outlook of what now was being called nature conservation, rather than the more limited term of preservation.

Under the heading of long–term datasets, Sheail (1995) narrates that H. N. Southern, in his 1969 presidential address to the British Ecological Society, perceived ecology to be at an important crossroads. There was, according to Southern, a 'terrifying imbalance' between human population and the availability of food and space. Sheail recounts that it might be objected that ecology was too important to be left to ecologists but, Southern asked, 'Who, except an ecologist, has any data upon which even to suggest an optimum equilibrium between men and resources in the world?' Further, as Sheail reports, "Ecologists should quicken their consciences and intensify ecological research and training. Since their advice might not be consciously sought, ecologists had to take the initiative. An outstanding example of what might be achieved, says Sheail, using English archival sources, was provided by Rackham, first in his studies of woodland history and then in his *History of the countryside*, published in 1986." Sheail relates that Rackham censured "practically everything that had occurred in the present century. Every rural change since 1945 had extended 'what was already commonplace at the expense of what is wonderful or rare or has meaning' (Rackham 1986). Sheail added that Peterken's (1981) volume, *Woodland conservation and management*, was more innovative, in consciously seeking to assist the forest industry in making adequate provision for nature conservation and landscape conservation, drawing on a knowledge of history and ecology in meeting that goal".

I was struck in the 1980s by reading both Rackham's and Peterken's books, and I took the opportunity while I was in Britain to meet them and discuss their interests and their methods of ecological history. Their writing was about Britain, but their mode of enquiry was universal. I had wondered whether I was being distracted into ecological history from the immediate tasks of field survey, experimental design and a focus on the question of the impact of logging on the fauna of the forests, which was the NSW government directive to which I was operating at the time. I was working with Tanya Leary in our effort to determine what had been the impact of European settlement on the fauna of the Eden district in south–east NSW since the first European occupation in 1830, and with Chris Moon on the ecological history of the forests in which we were studying the fauna (Lunney and Leary 1988; Lunney and Moon 1988). Both Rackham's and Peterken's books[14] confirmed that we were making a useful, even novel, contribution to a long–term understanding of how to interpret change in the forests of a region, and their fauna. The relevance of all this discussion of long–term data, ecological history and the role of the ecologists has not always been immediately apparent to those with the responsibility to conserve our fauna and our natural areas, or restore our damaged landscapes. The answer goes to the questions of how to integrate fauna conservation into the selection and management of protected areas, how to see the role of protected areas and the crucial importance of long–term scientific research in a broader landscape where commercial uses are dominant, but fauna conservation can be included, such as on farms and in forests being logged, and how to establish a long–term vision that draws on ecological history, not just fashion, or an imported vision of what constitutes a protected area, or how much it can be used commercially or for recreation. What has made a study of the British approach to nature conservation so inspiring is its ecological basis, its whole of landscape approach, including the ecological crisis arising from too many people, and the idea of nature conservation being retrospectively fitted to an already much changed landscape.

---

[14] George Peterken wrote a second edition in 1993, and Oliver Rackham has produced a long run of scholarly books, some of which extend beyond Britain, that will repay careful reading by anyone interested in ecological history, or to use of one Rackham's phrases, the making of a landscape. The idea of the environment as subject for study has now taken root, with the Australian and New Zealand Environmental History Network and the Australian Forest History Society being local examples of a growing discipline.

By 1999, Sheail (1999) could report that the year marks the fiftieth anniversary of the founding of the Nature Conservancy, which he emphasises is the first body of its kind anywhere in the world. It was required, says Sheail, as a scientific body to act on the behalf of the UK Government in protecting the wild plant and animal life, and the geological and geomorphological interest of England, Scotland and Wales. In short, says Sheail, it was to have three functions: to give advice on nature conservation; to select, hold and manage a series of National Nature Reserves; and to undertake the research relevant to those functions. The granting of its Royal Charter in 1949 and conferment of the necessary statutory powers represented a signal achievement, says Sheail, for the handful of ecologists involved. This detailed history by Sheail (he has written many more historical accounts on this theme, all are fascinating) shows the British way of seeing the issue of nature conservation as being about both the world of botany and of ecology more broadly. Sheail mentions wildlife, but does not cover that in detail, it is the emphasis on selecting and managing reserves, and on ecological research, that had captured not only the scientific imagination, but had achieved the support of the British government. What is also striking is the rise of this formal position as occurring in the years following World War II. In effect, the rise of nature conservation is recent, with most of it occurring within my lifetime. It is thus not surprising that there has yet to be wide acceptance of the central tenets of nature conservation being ecological, historical and research–based. This is a long way from a principally recreational emphasis.

A milestone in nature conservation in Britain is Derek Ratcliffe's (1977) *A nature conservation review*. My intent is not to canvass its contents but to comment on its timing. A review of its two volumes by Frazer (1977) is most helpful in covering the context for its production. As Frazer reports, for the past decade, conservationists in Britain had been waiting for this work to be published. Its subtitle is 'The Selection of Biological Sites of National Importance to Nature Conservation in Britain', and it represents the distillation of the knowledge of the former Nature Conservancy in its research and conservation branches (now split, says Frazer, by government decree into the Institute of Terrestrial Ecology and the Nature Conservancy Council). This report, says Frazer, is unique, encompassing all sites of importance throughout Britain and it had its origin in the need for the Nature Conservancy to be aware of all the key sites – as an aid in selecting a complete and representative series of national nature reserves. In 1965, Frazer adds, the regional staffs and a series of habitat teams started to survey all areas that were of possible wildlife interest. Frazer concludes that the achievement in these two volumes is an example to the rest of the world – in no other country has such an appraisal of the semi–natural environment and of the key sites even been attempted, yet this is the essential foundation to even start to consider the conservation of wildlife. When I visited the Nature Conservancy in Peterborough in the 1980s and 1990s, one of the staff had mentioned that Ratcliffe's review was a possible trap. If a piece of Britain was not in the review, then it was open to development, i.e. the point of the list from some official viewpoints was not only to include areas for conservation, but to release other areas for commercial uses. Whether or not that eventuated, the point is that a review had not been undertaken before 1977, and even then, it was a world first, and is remarkable in that it is so recent. The interpretation of the timing is that nature conservation aimed at conserving a nation's wildlife is a very modern idea, dating only from the last part of the 20th century.

Australia

In 1970, when I first read the papers in the proceeding of the First World Congress on National Parks (Adams 1962) as the most up–to–date international document of importance, it was apparent that science, particularly ecology, was relevant, and indeed vital, but it was not possible then to discern what role it actually fulfilled. In fact, it appears now that it was only a minor role. Duffey (1974, p v), in *Nature reserves and wildlife*, confirms that view when he comments that, at least for the UK where he was writing, the study of wildlife conservation as a scientific problem is one of the most recent developments in applied ecology, but it is too early to claim that it has become a subject in its own right. We need more historical accounts, we are signally short of them in Australia, although Krebs' (2012) stinging piece about the demolishing of the CSIRO division of wildlife is a gem: "Increasing public interest in our iconic flora and fauna has been matched by decreasing governmental support… and all this in an era of changing climate."

Protected areas are often under–estimated, both for wildlife research and as havens for fauna populations, and for the research value of protected areas to conserve biodiversity in NSW (Lunney 1998; Lunney *et al.* 2017a,b). The published articulation of these values, and specifically the value of National Parks and Nature Reserves for research, is hard to find except in the recent literature. A review of the last four decades of published papers shows how recent our work is and how much has changed in this short time. Ride (1980), in a landmark publication, *The value of national parks to the community* (Messer and Mosley 1980), gave a detailed and coherent statement of their value for science. Ride (1980, p 89) considered that since science is systematic and formulated knowledge, then the scientific value of a national park is measured by the extent to which it enables knowledge of the objects, and of the processes, that occur within its boundaries, to be gained, transmitted and applied. Accordingly, Ride stated, parks may be useful to science by promoting the practice of scientific discovery, the application of science (technology), scientific understanding and the training of scientists, and aesthetic values perceptible to those with scientific knowledge. Ride (p 90) added that, for science, national parks have value because they are secure and managed areas that enable current investigation, preserve potential for future investigation, and link past and future studies by preserving sites that have already been investigated thus enabling changes with time to be studied. Ride (p 92) noted that even if a park fulfils the requirements of security, representativeness and size, its value to science remains unfulfilled unless it is administered appropriately to encourage scientific work. Ride (p 95) set down our state of knowledge for 1979 by stating that the survey conducted by the Australian IBP/CT Committee demonstrated that the extent of knowledge of even the most obvious vegetation of Australian conservation areas is miserable, but that the "deficiencies in our knowledge of animal compositions are even greater and can only be dimly perceived". Among his concluding remarks, Ride (p 99) stated that what is needed is an aggressive and active program of studies in parks to establish natural baselines, and to define the needs of the parks systems if they are to provide representativeness and extent.

In his penultimate paragraph, Ride (1980, p 102) commented that there are signs that scientists are increasingly taking up the challenge. For Victoria, the only State where Ride had data, he reported that in the 2.5 years to June 1979, a total of 179 different people and organisations held research permits for studies in national parks, and that the research effort appeared to be spread more or less uniformly throughout all the major environmental systems reserved in national parks. These statements by Ride convey three things: the 'in principle' value of protected areas for research and the condition necessary for research to be effective; the importance of scientists recognising the long–term value of research in protected areas; and the dismal state of knowledge of the biodiversity within the protected areas system. All these points remain current, but we need to acknowledge the value of the increase in technology for recording, dispersing and examining information. For NSW, this has allowed us to critically evaluate where the shortfalls in information lie and to undertake an evaluation of fauna records held by the Office of Environment and Heritage NSW in the Atlas of NSW Wildlife and in scientific licences (Lunney *et al.* 2017b), as well as to appreciate the rate of increase in knowledge since Ride's review.

Under the heading of "National parks: a museum, a garden and an asylum" (in deference to G. P. Marsh 1874), Lunney and Recher (1979) put forward the view that Australia's national parks should be located to sample the full range of the continent's natural diversity and ensure the survival of wildlife. We added that the existing parks and reserves will not adequately protect Australia's wildlife and urged that we develop an adequate system of parks and reserves for the enjoyment, education and edification of future generations. We followed up on this theme in the next edition of our textbook, and concluded that national parks are the centrepiece of Australia's nature conservation programs, yet the existing parks and reserves will not adequately protect Australia's wildlife, and that wildlife and their habitats must also be managed and conserved on freehold land or privately owned land as well as on all public or Crown lands including those such as State Forests (Lunney and Recher 1986).

The Australian Academy of Science standing committee on national parks and conservation produced a statement on scientific research in national parks and similar reserves (Turner 1980). The statement "stresses the immense value of research in national parks, argues that scientific research is a legitimate use of these and similar reserves and that it should be encouraged under a proper system of constraints." (See Lunney *et al.* 2017b for an analysis of the extent of research on fauna in the parks and reserves in NSW.) Turner (1980, pp 3–4) reports that Harroy (1974), as chairman of the International Commission on National Parks, stated that three motivations guiding the founders of a national park are to prevent human exploitation in order to conserve species, ecosystems or areas of natural beauty; to enable visitors to benefit at different levels (recreational, educational and cultural) and to benefit from this conservation by scientific studies which would be impossible elsewhere. As an education officer for the NSW National Parks and Wildlife Service, from 1970 to 1973 before turning to research, I was using this language and these ideas, as they best expressed the rapidly rising interest in national parks and nature reserves. What was active at the time, and remains so in some form or another, was the discussion on whether the role of research in national parks was principally to assist in the management of the park. Turner noted (p 8) that the need for research directed toward management in parks was now (i.e. 1980) widely accepted, but that there remained considerable differences of opinion concerning the place of basic research. The Australian Academy of Science comes down on the side of research in national parks, recognising (p 9) that in a "world of rapidly diminishing national resources, parks and wilderness will eventually become the major sites" for research. Lunney (1998) observed that the case for conserving natural areas for research needs restating to point out that in 100 years' time it may be too late, and what we do not set aside now for science may never be set aside. This view is even more pertinent as the decades pass. As Turner

(1980, p 9) points out, one of the most important tasks for ecologists is to set up permanent quadrats where changes may be regularly monitored over long periods (at least 100 years). However, as Lunney *et al.* (2012) point out for Nadgee Nature Reserve, having a wilderness decision declared over the reserve inhibits research. Research is no longer a priority, or even a reason for the declaration of wilderness so that intact ecosystems remain available for study. Consequently, local managers feel obliged to reject or restrict any research that may appear as intrusive, such as conspicuous permanent quadrat markers, scientific equipment, research huts, access roads, or any sense that a wilderness experience might be marred for a visitor walking through.

Martin Taylor (2015) presented an Australian contribution to the thesis of 'protecting the wild' and his view is summarised in his chapter title: 'Parks: the best option for wildlife protection in Australia'. Taylor states that protected areas have long been regarded without question as the primary conservation tool (p 269). He adds that despite the major recent advances in protected area investment and outcomes in Australia, government support has wavered. This, says Taylor, is linked to a growing criticism of the protected areas approach to conservation. Critics, says Taylor, contend that parks are too expensive and insufficient to prevent biodiversity loss, do not really stop biodiversity loss, are poorly managed, or are superfluous because they are mostly on residual land, e.g. too rugged or too unproductive. Finally, Taylor adds, it has been claimed that, with climate change, parks are all in the wrong places. Taylor tackles each of these assertions and at the end of his chapter he concludes that national parks and other highly protected areas provide the best option for wildlife protection in Australia.

We are fortunate that John Whitehouse (1990) recorded the ideas that were the basis for nature conservation reserves in NSW in the latter part of the 1980s[15]. As the immediate previous director of the NSW National Parks and Wildlife Service, he had the space and the freedom to reflect on the organisation that he had managed. Among the intriguing discussions and viewpoints that he raised was the issue of whether plant associations and alliances could form the foundation for the establishment of a reserve system and to what extent could a reserve system, fundamentally designed on flora, meet the requirements of fauna conservation. He added that although this is a subject for debate, the debate should not be a substitute for action.

In the subsequent edition of *Australian zoologist*, there was a raft of replies that enlarged the discussion and added new viewpoints and facts. An earlier director, Don McMichael (1990) made it clear that there can be little doubt that, for practical reasons, the primary goal of the Service's land acquisition program during those early years was to increase the estate as quickly as possible from the stock of available Crown land. Jim Starling (1990), whose response was based on a long association with the National Parks and Wildlife Service including the period up to 1976 when he was responsible for new area investigations, and before 1967 as a member of the staff of the Fauna Protection Panel for about a year, points out that in 1967, compared with 1990, there was very little basic understanding of the ecology or dynamics of the Australian natural landscape. Source material was generally broad brush descriptions. Very early in the land investigation process, says Starling, decisions were being made on the basis of representativeness and uniqueness or unusualness. Many of the areas proposed for reservation or declaration had been inherited from the Fauna Protection Panel. Some areas, Starling adds, were given priority for quite opportunistic reasons; for example expiring western lands leases focussed attention on the semi–arid regions of New South Wales during the period up to 1975. The striking point that Starling makes is that the gaps in the nature conservation system were virtually the whole state, so sampling strategies or investigation programs were driven by broader considerations than is the case where the sampling program focusses on specific gaps in a more complete system. Don Johnstone (1990), director of the NSW National Parks and Wildlife Service 1973–85, commented that: 'Sadly, I must endorse John's comments that: 'The assumption that public policy decisions in nature conservation are made on logical scientific grounds by expert agencies is of course illusory" and; "Often the dynamics of this interaction (pluralistic decision making) have meant that the nature conservation agency is neither the sole arbiter [sic] nor the principal driving force in the reserve establishment process."

Allen Strom (1990) says that, writing as one who has been heavily involved in the nature conservation movement since the late 1930s, if the prime objective of nature conservation is to conserve the diversity of the biomass, the Service has failed during its 22 years lifetime. There are of course, says Strom, many reasons for the failure and Whitehouse has referred to some of them, but not all or even the most significant. Strom elaborates that nature conservation has been seen to be dependent upon the establishment of reserves held in public ownership and, as Whitehouse clearly shows, not selected specifically for the contained natural systems, but for several reasons of which recreation in the bush, or beside the sea and so on, readily took dominance. In this respect, Strom remarks, committed individuals and organizations, amongst them the bushwalkers, dominated the concept of nature conservation. Selection of reserves on the basis of sampling of biotic communities, Strom comments, could not have been further from their thinking. Indeed, one could well say that many protagonists of national parks in the past and today had and have little knowledge or concern for the burden of Whitehouse's case for the sampling of natural systems. In a throwaway line, Strom reports that it was the intention of the Fauna Protection Panel to establish a System of Nature Reserves based on the concepts and practices used in the nature reserves of England and Scotland at that time. Strom states that the *Fauna Protection Act 1948* was an extraordinary piece of legislation because it strongly made the point that there should be dedication of lands for the purpose of ensuring the survival of species, or as Strom rephrased it, in other words, an ecological approach to wildlife conservation. When in 1949, says Strom, the Fauna Protection Panel set to work to establish a system of faunal reserves (later to be called nature reserves), the procedure of sampling natural systems was determined. The wildlife service had a distinct function from the national parks service. The wildlife service, says Strom, had functions beyond that of an estate and planned to promote nature conservation in multiple land use programs, an aspect that Strom asserts is singularly absent from the current management.

---

[15] Another approach to the history of the ideas for nature conservation reserves, primarily national parks and nature reserves, is to include the personalities and the politics. These were powerful drivers, and some names still resonate, especially for those who, like me, were there. One example is Peter Hitchcock, who deserves to be remembered as one of the highly successful NPWS employees. His ability, determination and leadership of a dedicated new areas selection team were outstandingly successful in driving the amazing growth of the size of the Service estate for the latter part of the 20th century, particularly the 1970s and 1980s. He preferred to dedicate 1000 ha to the conservation estate than write 1000 words. But as we know, those who write are those who are remembered and therefore influence the historical interpretation of events.

Paul Adam (1990) comments that Whitehouse provides an explanation of how the present reserve network was developed and that during the first twenty or so years of the National Parks and Wildlife Service's existence, the organization's conservation objectives have been unclear, or so broadly defined that land acquisition was to a large extent driven by opportunity and outside pressure, although at least ostensibly remaining within the framework originally developed by the Scientific Committee on Parks and Reserves. Adam notes that Whitehouse argues that the model for the Service is to be sought in the United States National Park Service, and certainly the public identification of NPWS is of a body similar to its United States counterpart, but Adam is of the view that if the Scientific Committee has antecedents, he suggests that they are in the committee which met in wartime England to produce Cmd 7122 – "Conservation of Nature in England and Wales" (also see Marren 1994, p 15).

Bob Pressey (1990) made an original contribution to this discussion, which presaged his subsequent international contribution in this field. He acknowledged that the NSW National Parks and Wildlife Service, and the authorities which preceded it, had recognized that the reserve system should represent the full range of the state's biophysical diversity. Pressey also noted that Whitehouse had made two important points about the achievement of this goal in New South Wales. The first was the apparent adequacy of the reserve system and the areas selected for new reserves[16] depend very much on the way in which biophysical diversity is defined. The second was that progress towards a fully representative reserve system is less direct when opportunism replaces a more systematic program for reserving natural features. The issues of a suitable database and a systematic procedure for reserve selection deserve much more discussion, says Pressey, and these subjects have since surged, reaching significant levels in academic achievement. In 1990, Pressey stated that, ideally, the database for biological conservation would consist of comprehensive information on the distribution, abundance and habitat requirements of all the species. In reality, says Pressey, such information is never available when decisions on the locations or reserves are made and is approximated in only very few regions. In most regions, the best information for reserve selection and assessments of the impacts of developments consists of a map of land classes (vegetation types, land systems etc.) and a list of species considered to warrant particular attention because of rarity and/or threat. That was the state of play in 1990. However, the issue of limited databases and the constraints that they impose on reserve selection remained thematically with Pressey, and indeed the other researchers in that field. Pressey (1994) laments the lack of comprehensive data on species, and the biases in the data that do exist. I agree, and in an accompanying paper we identify the degree to which this problem persists, and we have also attempted to show the nature of the biases (Lunney *et al.* 2017b).

Carvalho *et al.* (2010) examined the use of different types of data on species distribution in reserve selection. They point out that, ideally, systematic conservation planning would use complete information on biodiversity, but they acknowledge that information on most species is grossly incomplete. Lunney *et al.* (2017b) provide a measure of the extent, and incompleteness, of biodiversity in NSW. That will at least caution planners not to rely on existing information if they are in a policy rush to make a decision on the placement or boundaries of a reserve.

Pressey was initially focused on NSW. In one study, Pressey and Taffs (2001) identified priority areas in western NSW defined by irreplaceability and vulnerability to vegetation loss. They derived information on the vulnerability of 248 land systems to two threatening processes (clearing and cropping) and measured the irreplaceability of potential conservation areas. Their results are maps of areas where conservation action is most urgently needed if regional conservation targets are not to be compromised. Pressey *et al.* (2002) examined the effectiveness of protected areas in north–eastern NSW by applying two chronological comparisons: the reserve system in 1994, 1996 and 1997; and before and after the Interim Assessment Process of 1996 which involved negotiations over new reserves and extensive unreserved areas that were temporarily deferred from logging. Their finding, that despite expansion of formal conservation and progress towards conservation targets, gazetted reserves remained strongly biased to the steep and/or infertile parts of public lands. What this presents, say Pressey *et al.*, are two major challenges for future conservation decisions, both in the region and conservation planning generally: "(1) to focus protection within public tenure on habitats and species most vulnerable to threatening processes such as logging; and (2) to provide more effective conservation management on private lands where loss of native vegetation continues".

---

[16] Pressey *et al.* (1993) define the term 'reserves' to describe areas under a range of *in situ* protection measures, from wilderness to managed extraction of resources for commerce or subsistence. I use the terms 'national parks and nature reserves', 'reserves' and 'protected areas' with similar or, in most cases, identical meanings. The most current generic term is 'protected areas', but in NSW, for example, you visit a national park (along with literally millions of others) not something called a 'protected area'.

While I can readily agree, what it also requires is a social and political analysis of the decision–making process that finished up with the bias intact, the very bias that was meant to be overcome. For example, Lunney and Matthews (2001) examined their citizen science records of the spotted–tailed quoll *Dasyurus maculatus* – a threatened species – and compared them to the captures in the Comprehensive Regional Assessment process. This process was meant to cover the whole region, but in fact focused on forested land, with an emphasis on State Forests. The result was a truncated view of quoll habitat, and a transfer of State Forests to National Park tenure. Thus the frustration of Pressey *et al.* (2002) is understandable, but it would seem that it was academically too far ahead of its time to become political policy. Local logging politics was more powerful. This point emerges in Flint *et al.* (2004), who recognised politics as the background driver in Braithwaite (2004), including the politics of focusing so narrowly on threatened species, rather that all species (Dickman and Steeves 2004). This increasing focus on threatened species as narrowing the conservation agenda to the detriment of conserving biodiversity is examined in its historical context by Lunney (2017a,b). By 2013, this idea had become much firmer. For example, in an editorial in *Conservation Biology*, Ritchie *et al.* (2013) point to continental–scale governance and the hastening of loss of Australia's biodiversity, stating that recent legislative threats to Australia's parks have come about apparently to cater to particular political interests. Their writing is candid, but they are clear that the scientific evidence for maintaining a well–managed system of protected areas in terrestrial and marine landscapes for conserving biodiversity is overwhelming. They conclude by saying that "although Australia's nominally protected areas increase in area, the trajectory of real commitment to conservation is in decline along with Australia's biodiversity".

Pressey (2015) saw the world differently after more than a quarter of a century of working on reserve selection. By 2015 he had formed the opinion that Australia's record in establishing protected areas to save biodiversity is poor. The reason, he posits, is that the objective for protected areas to conserve nature competes poorly with those related to economic development and the extraction of natural resources. He urges governments and NGOs to use measures for protected areas that reflect real progress, instead of obscuring lack of progress by only using such measures as the number of additional hectares dedicated as parks or reserves. Pressey (2015) makes a telling observation: if Australia's system of protected areas is the cornerstone of the nation's efforts to conserve biodiversity, then that implies considerable responsibility. Thus, if protected areas are not working, then Australia's unique biodiversity is in serious trouble. Pressey proposes that since saving species is important, then evaluating the impact of protected areas is essential, and Australian governments should be supporting the establishment of this field here in Australia. This would involve, says Pressey, establishing a national working group of scientists, policy–makers, and conservation practitioners to promote the science of impact evaluation of protected areas and study real–world applications of their impact on decision–making. Pressey (2015) concludes with the warning, "Every year of delay means irreversible, avoidable loss of biodiversity." Given Bob Pressey's long experience, this is a caution we must heed. Collectively, all these matters underline that dedicating areas as national parks or nature reserves remains a contested ideal. Given the long history of resistance to establishing protected areas, the nation's fauna is at an ever–increasing risk of extinction as natural habitats are relentlessly lost to economic growth and a rising human population.

A current overview

It is not my intention here to cover the brilliant array of publications on the increasingly sophisticated sciences of reserve selection and systematic conservation planning, but it is relevant that I note some of the papers that highlight the various problems of conserving fauna, the limitations of the databases, and criticisms of the biases in the existing system of protected areas. A missing thread through many recent papers is the lack of serious consideration of the historical context in which national parks and nature reserves were selected, or how fauna was protected. That context is important, as I have endeavoured to show in this paper. It not only helps explain the origin of today's identified biases, but shows that the conceptual basis for the selection of protected areas and the management of native fauna was not as well developed as it is now, nor were there many people working in this area compared with today. Given that there were so few staff in earlier decades assigned to select new parks and reserves, there were some remarkable achievements. I remember discussing this matter with Jim Starling (whose views appear in Starling 1990), who in 1990 remarked to me that there is no way today that we would have established national parks and nature reserves along a third of the NSW coast. The time to make that move was in the early 1970s. From another angle, I asked Peter Hitchcock in the latter part of the 1980s, as the rainforest decisions were being consolidated (see Paul Adam's 2017 paper), would the conservation focus now switch to the woodchipped forests of the south coast? Hitchcock[17] said that it would not, because the communities that fought to save the rainforests from logging would stay on the north coast. The implication here is that timing is crucial, community support is crucial, but community support is local and at the highest level political will is transient. No doubt all these factors can be synthesised and scholars should be encouraged to try. However, until the early 1990s, none of this was feasible because, a) staff did not have computers on their desks, b) Geographic Information System (GIS) was in its elementary developmental phase and, c) most importantly, the resistance to the growth of protected areas was palpable if they were to be obtained from land that had other uses, especially prior, current or potential commercial uses, such as logging, farming or mining. Fauna protection beyond the boundaries of protected areas was hard to achieve (see Recher 1998) and often bitterly fought in the courts, with the passage of the NSW *Endangered Fauna (Interim Protection) Act 1991* identifying a turning point (Lunney 2017b) in favour of at least a limited group – the endangered fauna. This has been something of a trap in that endangered fauna (called threatened species since the NSW *Threatened Species Conservation Act 1995*) have dominated the conservation agenda at the expense of non–threatened fauna, which we dubbed "the neglected 74%" in Lunney *et al.* (2004), and biodiversity conservation in its broadest sense (Lunney 2017a,b).

Possingham *et al.* (2002) succinctly captured this problem in their study on the limits to the use of threatened species lists. They identified that such lists provide an estimate of the risk of extinction, but they have been used for purposes for which they were not designed, and consequently they perform poorly. For example, they point out that threatened species are one of the few legal instruments available to limit development, but if there is no evidence that listed species are present, or impacts are negligible, development may proceed. I examined the rise of the hegemony of threatened species at the expense of a much broader view that includes all species in the conservation agenda (Lunney 2017b). Compounding this problem is the taxonomic bias towards vertebrates, or as Ponder (1992) called it, a bias in biodiversity – a view expanded in Ponder and Lunney (1999) with its focus on invertebrates.

Hutchings (2004) makes the case clearly, pointing out that invertebrates dominate both terrestrial and aquatic environments, yet few have been listed as threatened. A more effective avenue for their conservation, Hutchings argues, is the conservation of habitats and communities and legislation to tackle key threatening processes. Walsh *et al.* (2012) examined the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and concluded that entire phylogenies of less charismatic species may miss out on conservation resources and management planning for recovery, particularly the under–represented species, such as invertebrates. Most importantly, Walsh *et al.* state, species that are not listed are not protected and no legal mechanism exists to prevent the destruction or degradation of their habitats. Walsh *et al.* further comment that the biased and incomplete listing and planning processes lead to funding for conservation being distributed inefficiently because listing and recovery planning for threatened species appear to be biased by charisma, body size and level of knowledge. I add that while the EPBC Act is national in outlook, it is not its responsibility to conserve Australia's biodiversity. That is overwhelmingly a State matter. A focus on the States would yield a better picture of the strengths and shortfalls in conserving biodiversity because responsibility for non–threatened species and for almost all protected areas lies with the States (see also Lunney 2017b).

By looking at global trends in the future loss of mammal species, Visconti *et al.* (2011) have turned the spotlight on one class of vertebrates – mammals – where there is widespread decline and extinction, pointing out that a quarter of the world's mammals are threatened with extinction. They found that protected areas will not avert the pressure on mammals from the growing demand for agricultural products; that protected areas are necessary but not sufficient (also see Lunney 2017c). Conservation, they consider, will include enforcement of environmental rules, stabilising populations, improving forest management and limiting the impacts of climate change. What is interesting here is the approach to the problem of conservation, not through an analysis of protected areas, but through a predicted loss of habitat. To stem the losses, the authors advocate a mix of policies that is consistent with a species approach to conservation and that will vary according to location. For NSW this will require a greater emphasis on all species, not just threatened species, and include sustained research programs to be able to interpret the past and gain some grasp of future trends.

In their analyses of the distribution of protected areas and threatened terrestrial birds, mammals, and amphibians to assess current and possible future coverage of these species, Venter *et al.* (2014) found that the global protected area estate is biased toward locations that are cheap to protect and away from important areas for biodiversity. They discovered that 17% of the 4,118 threatened vertebrates are not found in a single protected area and that 85% are not adequately covered to a level consistent with their likely persistence. Using systematic conservation planning, the researchers showed that expanding protected areas to reach 17% coverage (i.e. Aichi target 11, see footnote 3) by protecting the cheapest land, even if regionally representative, would increase the number of threatened vertebrates covered by only 6%. They then calculated that the nonlinear relationship between the cost of acquiring land and species coverage means that fivefold more threatened vertebrates could be adequately covered for only 1.5 times the cost of the cheapest solution, if cost efficiency and threatened vertebrates are both incorporated into protected area decision making. If this expansion of the global protected area estate is to secure a future for imperilled species, the researchers concluded that new protected areas must be sited more strategically than is presently the case. The authors observed that the adoption of the Aichi targets marks an historic opportunity for achieving conservation of the world's biodiversity. If countries are to meet the protected area Aichi target, they point out that at least 5.8 million km^2 of new protected areas will need to be created by 2020. The authors conclude their study by noting that for the global protected area network to fulfil its potential role as the cornerstone of biodiversity conservation, and for governments to meet their commitments on protected areas and species extinctions, the distribution of threatened species must inform future protected area establishment. Preventing the further loss of all threatened species is a lofty goal, they comment, and it will require substantial efforts.

---

[17] In my recent email exchange with Peter Hitchcock, he expressed his hope that a history of the NSW National Parks and Wildlife Service would be written but he said that he was not the person to write it. Any such history would feature Hitchcock as a leading figure in the acquisition of national parks in NSW, and his role in the rainforest decisions is acknowledged in Adam (2017).

From an historical perspective, the study by Venter *et al.* (2014) lays a clear emphasis on knowing the fauna, both within and beyond protected areas, and recording the data onto accessible databases. What also strikes me as an important next step is to add more groups of organisms (their study was limited to birds, mammals and frogs), with reptiles being an early choice. I would also extend the studies to include all species, not just those that are sufficiently well known as to have met the strict criteria to be formally listed as threatened (Lunney 2017a,b). One might also note the researchers' implied goal is for the protected area network to fulfil its potential role as the cornerstone of biodiversity conservation. While this is a magnificent vision, there can be considerable shortfalls in what governments around the globe see as important. When one considers that the weight of the history of the goal of protected areas is not on the side of this vision, the importance of stressing the point that it now should become the accepted goal is clear. Finally, of great importance is to note that Venter *et al.* (2014) are research scientists, almost entirely within universities where research is encouraged. My argument is that research into these matters is of fundamental importance, yet that value is not as well appreciated as it might be in governments or government departments with the direct and immediate responsibility for conserving fauna and selecting protected areas.

The point about the need to take far–sighted measures to conserve our fauna, with protected areas being a major part of the action needed, is evident in Woinarski *et al.* (2014, p v), in their thorough, award–winning[18], *Action Plan for Australian Mammals 2012*. They concluded that 29 Australian terrestrial mammal species, which is more than 10% of the endemic mammal species, had become extinct since European colonisation[19] in 1788 and a further 56 species (18%) are threatened with extinction. When a parallel list for NSW was called for under legislation[20], we provided it. Lunney *et al.* (2000, p10) assessed the status of all the NSW fauna in 1992 – the only such major assessment – and concluded that 27 mammal species had become extinct in the State since European settlement, and a further 50 were threatened with extinction, leaving only 53 of the total of 130 mammal species for NSW as neither extinct nor threatened (also see Lunney 2017b).

Sustaining the important role of environmental education

While looking at the importance of protected areas, most spectacularly national parks, for fauna conservation, their role in education for nature conservation must not be overlooked. Even those committed to conserving our fauna in the Faunal Protection Panel from the early 1950s, through to the NSW National Parks and Wildlife Service from 1967, including Panel members Allan Fox and Allen Strom, were as equally dedicated to education as to wildlife management. Both Fox and Strom had been teachers and their skills in presentation of the new concepts of nature conservation were masterful. Allan Fox was a wonderful mentor to me in the early 1970s as a new recruit to both wildlife management and the importance of protected areas, and I acknowledge his legacy in the history of Nadgee Nature Reserve (Lunney *et al.* 2012). In 1970 I accompanied Allen Strom, then at the NSW Department of Education, as he took a primary school class for a bush walk in Ku–ring–gai National Park, on the northern edge of Sydney. Allen asked all the class to sit still and remain silent. Within minutes, a small bird had landed on the head of a student, plucked a strand of hair from his head, flown into a nearby bush and begun weaving the strand of hair into its nest. The students were thrilled, they had never seen anything like it.

The same sense of awe appears in the foreword by Jarvis (2016, p 18), director of the US National Park Service, to a beautifully illustrated history of the US national parks. My extract from Jarvis' foreword captures a new generation: "Recently, a young man was participating in a youth experience program at Grand Teton National Park. It was his first time, and in many ways he represents the emerging U.S. population: urban, diverse, inexperienced in the national parks. He stopped his bicycle along the path, and while gazing at the Teton sunrise, broke into tears. If we could collect those tears (Harry Potter–like) and read their history and meaning I know that we would see a life changed, a self–discovery, and a positive promise for this young man because of his National Park experience." My reward for being an education officer was to enjoy that sense of others seeing more in natural areas and fauna than they had seen previously and, at the same time, realise that natural areas were disappearing in Australia, fauna populations were declining, extinction was an inevitable outcome of the rise in exploitative land uses and a rising human population, and the corollary that intervention of wildlife managers and researchers was much needed. However, that subject was in its infancy, and the science to draw upon to support that point of view was modest indeed. National Parks for recreation had gained a foothold in the public and political imagination by 1970, but fauna protection in its broadest sense, such as aiming to guarantee the indefinite survival all species, especially beyond the boundaries of parks and reserves, was a fuzzy concept to all but a few advanced thinkers and practitioners.

---

[18] Whitley award for the best zoological resource, *Australian Zoologist* 2016 **38**:329–240.

[19] Or as some pertinently note, invasion.

[20] *Endangered Fauna (Interim Protection) Act 1991* (NSW)

Conclusion

The purpose of the 2014 Royal Zoological Society of NSW forum was to focus on the value of protected areas for fauna conservation. The forum was timed to immediately precede the IUCN World Parks Congress 2014. Arising from the Congress was the "Promise of Sydney Vision"[21]. The vision recognizes "that threats to nature, its biological diversity and protected areas are now at the highest level in human history, due to a convergence at immense scale of the impacts of human consumption patterns, population growth, and industrial activity." The Sydney Vision then promises to "invigorate our efforts to ensure that protected areas do not regress but rather progress. … We will strive to promote sustainable land–uses and eliminate activities and policies that degrade, threaten or result in extinction or the loss of ecosystems and their biodiversity."

These ideals present an uplifting vision, but there is a powerful sense of desperation in the wording that the battle to conserve protected areas and all they symbolise is being lost. We are fortunate that there is an IUCN body that holds this vision. My contribution here is to see these ideals in an historical perspective, to show the conflict within the protected areas movement about their relevance for wildlife conservation, and to point out that recognising that protected areas play a vital role in fauna conservation is a new concept.

The anxiety in the IUCN Promise of Sydney is well–justified, but if we view the subject in its historical context, then we can be encouraged that we have learnt much since the first congress in 1962. The problem, as I read the historical record, is that although we are learning fast, the loss of species, landscapes and ecosystems is happening even faster. From my historical reading it is clear that all fauna, not just endangered species, need to be more prominent in the discussions on protected areas because this provides a clear point of interest for a wide and increasingly well–informed public, at least in Australia, and a strong measure of progress, or loss, and also allows many more researchers to be part of the grand vision that is embodied in the concept of protected areas (Lunney 2017a,b). From the First World Parks Congress in 1962 to today, the interpretation of the value of the national parks for fauna conservation remains contested, but the weight of historical and scientific opinion is ever stronger on the need for protected areas for conserving fauna. We need to see such grand movements as protecting areas, such as national parks and nature reserves, in an historical perspective. Otherwise we could arrive at the false conclusion that they have failed to conserve our fauna. To see present debates and dilemmas in their historical context – to know where we have come from, what we have done and left undone – is crucial if we are to continue to take positive action to protect natural areas and to study and protect all our fauna. Without natural areas rich with wildlife, our country and our lives will be grossly, and irretrievably, diminished. In that sense, this paper is more than just a historical overview. It is a call for action, a template for work, and a precise understanding of how that work should be done. The historical overview was undertaken for an activist reason: by knowing where we have come from we can map where to go.

Acknowledgements

I am indebted, as are so many others, to colleagues and friends both within the NSW National Parks and Wildlife Service, now the Office of Environment and Heritage NSW, and beyond, for their invaluable contribution to selecting, managing and debating the meaning of National Parks and Nature Reserves in NSW, and for researching and managing the State's wildlife. I also wish to thank Tessa Lunney and Chris Moon for their literary skills in editing a draft of this paper, and to referees for critical comments on the ms.

---

[21] http://www.worldparkscongress.org/downloads/about/THE%20PROMISE%20OF%20SYDNEY%20Vision%20eng%20version%20final%2019%20Nov.pdf

References

Adam, P. 1990. Response to papers by H. F. Recher and J. F. Whitehouse. *Australian Zoologist* **26**: 47–48.

Adam, P. 1998. Biodiversity– the biggest of big pictures. Pp 6–14 in *Is the biodiversity tail wagging the zoological dog?* edited by D. Lunney, T. Dawson and C. R. Dickman. Royal Zoological Society of NSW, Mosman, NSW, Australia.

Adam, P. 2013. Don't worry – be happy. Pp 71–87 in *Grumpy Scientists: the ecological conscience of a nation*, edited by D. Lunney, P. Hutchings and H. F. Recher. Royal Zoological Society of NSW, Mosman, NSW, Australia. https://doi.org/10.7882/FS.2013.016

Adam, P. 2017. The World Heritage List and New South Wales Rainforest – reflections on the events of 30 years ago. *Australian Zoologist* **39**: 228–256.

Adams, A. B. (editor) 1962. *First World Conference on National Parks: proceedings of a conference: Seattle, Washington, June 30–July 7, 1962*. International Union for Conservation of Nature and Natural Resources; UNESCO. Washington, D.C. National Park Service, United States Department of the Interior, Washington, D.C. https://ia600308.us.archive.org/15/items/firstworldconfer00adam/firstworldconfer00adam.pdf

Beltran, E. 1962. Use and conservation: two conflicting principles. Pp 35–43 in *First World Conference on National Parks: proceedings of a conference: Seattle, Washington, June 30–July 7, 1962*, edited by A. B. Adams. International Union for Conservation of Nature and Natural Resources; UNESCO. Washington, D.C. National Park Service, United States Department of the Interior, Washington, D.C.

Bolton, G. 1981. *Spoils and spoilers*. Allen and Unwin, North Sydney, Australia.

Bolton, G. 1992. *Spoils and spoilers* (2nd edition). Allen and Unwin, North Sydney, Australia.

Braithwaite, W. 2004. Do current forestry practices threaten forest fauna? A perspective. Pp 513–536 in the *Conservation of Australia's Forest Fauna (second edition)*, edited by D. Lunney. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

Butler, T. 2015. Pp xix–xxvii in *Protecting the wild. Parks and wilderness, the foundation for conservation,* edited by G. Wuerthner, E. Crist & T. Butler. Island Press, Washington DC, USA.

Byron, N., Craik, W., Keniry, J. and Possingham, H. 2014. *A review of biodiversity legislation in NSW. Final Report.* Independent Biodiversity Legislation Review Panel. 18 December 2014. Copyright State of NSW and the Office of Environment and Heritage. http://www.environment.nsw.gov.au/resources/biodiversity/BiodivLawReview.pdf

Carruthers, J. 2008. Conservation and wildlife management in South African National Parks 1930s–1960s. *Journal of the History of Biology* **41**: 203–236.

Carvalho, S. V., Brito, J. C., Pressey, R. L., Crespo, E. and Possingham, H. P. 2010. Simulating the effects of using different types of species distribution data in reserve selection. *Biological Conservation* **143**: 126–138.

Caughley, G. and Sinclair, A. R. E. 1994. *Wildlife ecology and management.* Blackwell, Cambridge, UK.

Clawson, M. and Fisher, J. L. 1962. Planning for a nation's system of parks. Appendix E P 414–423 in *First World Conference on National Parks: proceedings of a conference: Seattle, Washington, June 30–July 7, 1962*, edited by A. B. Adams. International Union for Conservation of Nature and Natural Resources; UNESCO. Washington, D.C. National Park Service, United States Department of the Interior, Washington, D.C.

Dickman, C. R. and Steeves, T. E. 2004. Use of habitat by mammals in eastern Australian forests: are common species important in forest management? Pp 761–773 in *Conservation of Australia's Forest Fauna (second edition)*, edited by D. Lunney. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

Duffey, E. 1974. *Nature Reserves and Wildlife*. Heinemann Educational Books. London, UK.

Flint, C., Pugh, D. and Beaver, D. 2004. The good, the bad and the ugly: science, process and politics in forestry reform and the implications for conservation of forest fauna in north–east New South Wales. Pp 222–255 in *Conservation of Australia's Forest Fauna (second edition)*, edited by D. Lunney. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

Frazer, J. F. D. 1977. Book review: *A Nature Conservation Review*, edited by Ratcliffe D. A. Cambridge University Press, Cambridge, England (on behalf of the Nature Conservancy Council and the Natural Environment Research Council). *Environmental Conservation* **4**: 316–317.

Hall, C. M. 1992. *Wasteland to Word Heritage*. Preserving Australia's wilderness. Melbourne University Press, Carlton, Victoria, Australia.

Harroy, J–P. 1974. A century of the growth of the national park concept throughout the world. Proceedings Second World Congress on National Parks. IUCNNR. Morges, Switzerland. (as cited in Turner, 1980).

Hutchings, P. 2004. Invertebrates and threatened species legislation. Pp 88 – 93 in *Threatened species legislation: is it just an Act?*, edited by P. Hutchings, D. Lunney and C.. Royal Zoological Society of New South Wales, Mosman, NSW, Australia

Hutchings, P. and Kenchington, R. 2017. Constraints of terrestrial protected area solutions in protecting marine biodiversity. *Australian Zoologist* **39**: 188–193.

Jarvis, J. B. 2016. Foreword. Pp 18–20 in *National Geographic the national parks: an illustrated history*, edited by Kim Heacox. National Geographic Partners, Washington, USA.

Johnstone, D. 1990. A former Director's response to: Conserving What? – The basis for nature conservation reserves in New South Wales 1967–1989. *Australian Zoologist* **26**: 93.

Jones, S. 2006. A political ecology of wildlife conservation in Africa. *Review of African Political Economy* **33**: 483–495.

Keiter, R. B. 2013. *To conserve unimpaired: the evolution of the national parks idea*. Island Press. Washington, USA.

Krebs, C. J. 2012. What good is a CSIRO division of wildlife research anyway? Pp 5–8 in *Science under siege: zoology under threat*, edited by P. Banks, D. Lunney and C. Dickman. Royal Zoological Society of NSW, Mosman, NSW, Australia.

Lunney, D. 1998. The role of national parks and nature reserves as a field for science. Pp 140–149 in *National parks: a new vision for a new century*, edited by P. Prineas. Nature Conservation Council of NSW Inc.

Lunney, D. 2010. A history of the debate (1948–2009) on the commercial harvesting of kangaroos, with particular reference to New South Wales and the role of Gordon Grigg. *Australian Zoologist* **35**: 383–430.

Lunney, D. 2014. Integrating history and ecological thinking: Royal National Park in historical perspective. *Proceedings of the Linnean Society of New South Wales* **136**: 157–199. http://ojs–prod.library.usyd.edu.au/index.php/LIN/article/view/7793/7954

Lunney, D. 2017a. Dangerous? Necessary: we must conserve all our native fauna. *Australian Zoologist* **38**: 281–288. https://doi.org/10.7882/AZ.2017.005

Lunney, D. 2017b. A dangerous idea in action: the hegemony of endangered species legislation and how it hinders biodiversity conservation. *Australian Zoologist* **38**: 289–307. https://doi.org/10.7882/AZ.2017.015

Lunney, D. 2017c. The missing voice: a zoologist on the consequences of feeding the world. *Australian Zoologist* **39**: 57–67.

Lunney D. and Leary, T. 1988. The impact on native mammals of land–use changes and exotic species in the Bega district, New South Wales, since settlement. *Australian Journal of Ecology* **13**: 67–92.

Lunney, D. and Matthews, A. 2001. The contribution of the community to defining the distribution of a vulnerable species, the spotted–tailed quoll, *Dasyurus maculatus*. *Wildlife Research* **28**: 537–545.

Lunney D. and Moon, C. 1988. An ecological view of the history of logging and fire in Mumbulla State Forest on the south coast of New South Wales. Pp 23–61 in *Australia's Ever Changing Forests. Proceedings of the First National Forest History Symposium*, edited by K. Frawley and N. Semple. Australian Defence Force Academy, Campbell, ACT.

Lunney, D. and Recher, H. F. 1979. National parks; a museum, a garden and an asylum. Pp 184–199 in *A natural legacy: ecology in Australia*, edited by H. F. Recher, D. Lunney and I. Dunn. Pergamon Press, Rushcutters Bay, NSW, Australia.

Lunney, D. and Recher, H. F. 1986. The living landscape: an ecological view of national parks and nature conservation. Pp 294–328 in *A natural legacy: ecology in Australia* (2nd edn), edited by H. F. Recher, D. Lunney and I. Dunn. Pergamon Press, Rushcutters Bay, NSW, Australia.

Lunney, D., Pressey, B., Archer, M., Hand, S., Godthelp, H. and Curtin, A. 1997. Integrating ecology and economics: illustrating the need to resolve the conflicts of space and time. *Ecological Economics* **23**: 135–142.

Lunney, D., Curtin, A.L., Ayers, D., Cogger, H.G., Dickman, C.R., Maitz, W., Law, B. and Fisher, D. 2000. The threatened and non–threatened native vertebrate fauna of New South Wales: status and ecological attributes. *Environmental and Heritage Monograph Series No. 4*. National Parks and Wildlife Service, Hurstville, NSW.

Lunney, D., Matthews, A., Cogger, H. and Dickman, C. 2004. The neglected 74% – the non–threatened vertebrates – and a reflection on the limitations of the process that fashioned the current schedules of threatened species in New South Wales. Pp 145–157 in *Threatened Species Legislation: is it just an Act?*, edited by P. Hutchings, D. Lunney, and C. Dickman. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

Lunney, D., Lunney, H. W. M. and Recher, H. F. 2008. Bushfire and the Malthusian guillotine: survival of small mammals in a refuge in Nadgee Nature Reserve, south–eastern New South Wales. *Pacific Conservation Biology* **14**: 263–278.

Lunney, D., Fox, A., Catling, P., Recher, H. and Lunney, H.W.M. 2012. A contribution to the ecological history of Nadgee Nature Reserve on the south coast of New South Wales. Pp 95–124 in *Australia's ever–changing forests; VI*, edited by B. Stubbs, J. Lennon, A. Specht and J. Taylor. Australian Forest History Society, Lismore NSW Australia.

Lunney, D., Hutchings, P and Dickman, C. 2017a. "Can we reverse the machinery which has ground down so much of this country?" The value of protected areas for fauna conservation: Editors' Prologue. *Australian Zoologist* **39**: 161–169.

Lunney, D., Hope, B. and Shannon, I. 2017b. The value of protected areas for fauna research and conservation: a case study of New South Wales. *Australian Zoologist* **39**: 296–344.

Marren, P. 1994. *England's national nature reserves.* T&A D Poyser Ltd., London, UK.

Marsh, G. P. 1874. *The earth as modified by human action*. New York. (as cited in Lunney and Recher 1979).

McMichael, D. F. 1990. The selection of land for nature conservation purposes in New South Wales. *Australian Zoologist* **26**: 78.

Messer, J. and Mosely, G. (eds). 1980. *The value of national parks to the community.* Australian Conservation Foundation, Hawthorn, Victoria, Australia.

Nicholson, M. 1957. *Britain's Nature Reserves*. Batsford, UK.

Peterken, G. F. 1981. *Woodland conservation and management.* Chapman and Hall, London, UK. (The second edition was published in 1993.)

Ponder, W. F. 1992. Bias in biodiversity. *Australian Zoologist* **28**: 47–51.

Ponder, W. and Lunney, D. (eds). 1999. *The Other 99%. The conservation and biodiversity of invertebrates.* Transactions of the Royal Zoological Society, Mosman, NSW, Australia.

Possingham, H. P., Andelman, S. J., Burgman, M. A., Medellín, R. A., Master, L. L. and Keith D. A. 2002. Limits to the use of threatened species lists. *Trends in ecology and evolution* **17**: 503–507.

Pressey R. L. 1990. Reserve selection in New South Wales: Where to from here? *Australian Zoologist* **26**: 70–75.

Pressey, R. L. 1994. Conservation planning and biodiversity: assembling the best data for the job. *Conservation Biology* **18**: 1677–1681.

Pressey, Bob. 2015. Every year of delay means irreversible, avoidable loss of biodiversity. *Australian Environment Review*. 30: 27–30.

Pressey, R. L., Humphries, C. J., Margules, C. R., Vane–Wright, R. I. and Williams, P. H. 1993. Beyond opportunism: key principles for systematic reserve selection. *TREE* **8**: 124–128.

Pressey, R. L. and Taffs, K. H. 2001. Scheduling conservation action in production landscapes: priority areas in western New South Wales defined by irreplaceability and vulnerability to vegetation loss. *Biological Conservation* **100:** 355–376.

Pressey R. L., Whish G. L., Barrett T. W. and Watts, M. E. 2002. Effectiveness of protected areas in north–eastern New South Wales: recent trends in six measures. *Biological Conservation* **106**: 57–69.

Rackham, O. 1986. *The history of the countryside*. Dent, London, UK.

Ratcliffe, D. A. (ed.) 1977. *A Nature Conservation Review*. Cambridge University Press, Cambridge, England.

Recher, H. F. 1998. Parks for biodiversity: an old and tarnished vision. Pp 128–139 in *National parks: a new vision for a new century*, edited by P. Prineas. Nature Conservation Council of NSW Inc.

Recher, H. F. 2017. Politics, emotion, and ideology: the reality of reserve selection for nature conservation in Australia. *Australian Zoologist* **39**: 257–271.

Recher, H. and Lunney, D. 2003. The problem with wilderness. *Nature Australia* **27**(9): 84.

Recher, H. F., Lunney, D. and Dunn, I. (eds). 1979. *A Natural Legacy. Ecology in Australia*. Pergamon Press, Rushcutters Bay, NSW, Australia.

Recher, H. F., Lunney, D. and Dunn, I. (eds). 1986. (Second edn). *A Natural Legacy. Ecology in Australia*. Pergamon Press, Ruschcutters Bay, NSW, Australia.

Recher, H. F., Lunney, D. and Matthews, A. 2009. Small mammal populations in a eucalypt forest affected by fire and drought. I. Long–term patterns in an era of climate change. *Wildlife Research* **36:** 143–158.

Ride, W. D. L. 1980. Value for science. Pp 89–106 in *The value of national parks to the community,* edited by J. Messer and G. Mosely. Australian Conservation Foundation, Hawthorn, Victoria, Australia.

Ritchie, E. G., Bradshaw, C. J. A., Dickman, C. R., Hobbs, R., Johnson, C. N., Johnston, E. L., Laurance, W. F., Lindenmayer, D., McCarthy, M. A., Nimmo, D. G., Possingham, H. H., Pressey, R. L., Watson, D. M. and Woinarski, J. 2013. Editorial. Continental–scale governance and the hastening of loss of Australia's biodiversity. *Conservation Biology* **27**:1133–1135.

Robin, L. 2013. Being first: why the Americans needed it, and why Royal National Park didn't stand in their way. *Australian Zoologist* **36:** 321–330.

Sellars, R. W. 2009. *Preserving nature in national parks: a history.* (The first edition was 1997, this edition has a new preface and epilogue.) Yale University Press, USA.

Sheail, J. 1995. Guest Editorial: The Ecologist and Environmental History – a British Perspective. *Journal of Biogeography* **22**: 953–966.

Sheail, J. 1999. Creating landscapes from the old – an English perspective on nature conservation. *Norsk Geografisk Tidsskrift–Norwegian Journal of Geography* **53**: 71–76.

Slade, C. and Law, B. 2017. The other half of the coastal State Forest estate in New South Wales; the value of informal forest reserves for conservation. *Australian Zoologist* **39:** 359–370.

Starling, J. 1990. Comments on an article by J. Whitehouse. *Australian Zoologist* **26**: 79–80.

Strom, A. E. 1990. Response to: Conserving What? – The basis for nature conservation reserves in New South Wales 1967–1989. *Australian Zoologist* **26**: 94–96.

Taylor, M. 2015. The best option for wildlife protection in Australia. Pp 266–275 in *Protecting the wild. Parks and wilderness, the foundation for conservation,* edited by G. Wuerthner, E. Crist and T. Butler. Island Press, Washington DC, USA.

Terborgh, J. 2015. Foreword. Pp xi–xvii in *Protecting the wild. Parks and wilderness, the foundation for conservation,* edited by G. Wuerthner, E. Crist and T. Butler. Island Press, Washington DC, USA.

Tilden, F. 1968. *The national parks*. Revised 1st edition in 1951. Alfred A. Knopf, New York, USA.

Turner, J. S. 1980. *Scientific research in national parks and nature reserves*. Australian Academy of Science. Canberra.

Venter, O., Fuller, R. A., Segan, D. B., Carwardine, J., Brooks, T., Butchart, S. H. M., Di Marco, M., Iwamura, T., Joseph, L., O'Grady, D., Possingham, H. P., Rondinini, C., Smith, R. J., Venter, M. and Watson, J. E. M. 2014. Targeting global protected area expansion for imperiled biodiversity. PLoS Biology **12**(6): e1001891. doi:10.1371/journal.pbio.1001891.

Visconti, P., Pressey, R. L., Giorgini, G., Maiorano, L., Bakkenes, M., Boitani, L., Alkemade, R., Falcucci, A., Chiozza, F. and Rondinini, C. 2011. Future hotspots of terrestrial mammal loss. *Philosophical Transactions of the Royal Society B* **366**: 2693–2702.

Wagner, F. H., Foresta, R., Gill, R. B., McCullough, D. R., Pelton, M. R., Porter, W. F. Salwasser, H. and Sax, J. L. 1995. *Wildlife policies in the U.S. national parks.* Island Press, Washington D.C. USA.

Walsh, J. C., Watson, J. E. M., Bottrill, M. C., Joseph, L. N. and Possingham, H. P. . 2012. Trends and biases in the listing and recovery planning for threatened species: an Australian case study. *Oryx* **47**: 134–143.

Warner, R. 2017. Marine Protected Areas – developing regulatory frameworks for areas beyond national jurisdiction. *Australian Zoologist* **39:** 181–187.

Whitehouse, J. F. 1990. Conserving what? – the basis for nature conservation reserves in New South Wales 1967–1989. *Australian Zoologist* **26**: 11–20.

Wilson, E. O. 1992. The diversity of life. Belknap Press, Cambridge Massachusetts, USA.

Wirth, C. L. 1962. National parks. Pp 13–21 in *First World Conference on National Parks: proceedings of a conference: Seattle, Washington, June 30–July 7, 1962*, edited by A. B. Adams. International Union for Conservation of Nature and Natural Resources; UNESCO. Washington, D.C. National Park Service, United States Department of the Interior, Washington, D.C.

Wirth, C. L. 1980. *Parks, politics and the people.* University of Oklahoma Press, USA.

Woinarski, J. C. Z., Burbidge, A.A. and Harrison, P. I. 2014. *The action plan for Australian mammals 2012.* CSIRO Collingwood, Victoria, Australia.

Wright, G. M., Dixon, J. S. and Thompson, B. H. 1933. Fauna of the national parks of the United States: a preliminary survey of faunal relations in national parks. Washington, D.D. US government printing office. (Reference from Wagner *et al.* 1995.)

Wuerthner, G., Crist, E. and Butler ,T. (eds). 2015. *Protecting the wild. Parks and wilderness, the foundation for conservation.* Island Press, Washington DC, USA.